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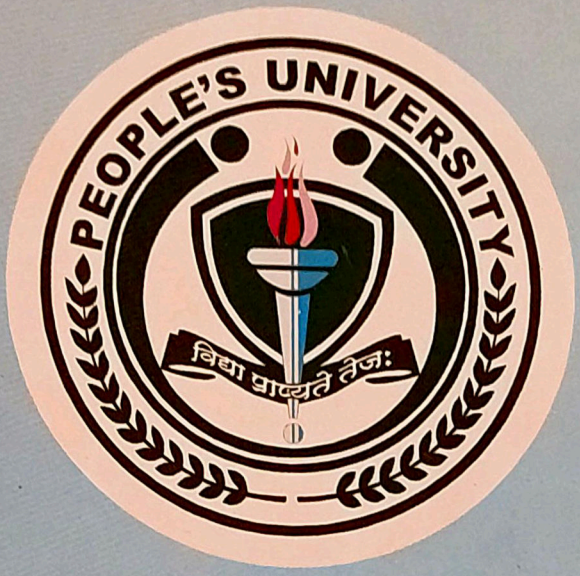
People's Journal of Scientific Research



AN INDEXED JOURNAL

VOL. 6 (2)

July 2013

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ISSN: 0974-6358

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Research Article

The Effects of Passive Smoking on the Placental Barrier: A Light Microscopic Study

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(Received December, 2012) (Accepted April, 2013)

Abstract:

Passive exposure to tobacco smoke causes ultrastructural changes in placental vasculature. It was endeavoured to observe under the light microscope, the endothelial cells of the capillaries and to look for microscopic changes in the vasculosyncytial membranes in the terminal villi of placentae of passive smokers exposed largely to bidi smoke. To study effect of passive smoking on placental vasculature a total of 150 placentae were selected from healthy full term gravidas with no history of tobacco use. They were divided into two group *viz*; passive smokers (n=87) and non passive smokers-control (n=63). Three micron thick sections were cut, stained and examined under light microscope. The study revealed that endothelial cells of stromal capillaries of the placental villi were oedematous resulting in irregular capillary lumina (p=0.0007) and vasculosyncytial membrane was significantly absent in terminal villi of passive smokers in comparison to control (p=0.0000).

Key Words: Passive smoking, Placentae.

Introduction:

Bidi smoking is the most popular form of smoking tobacco in India followed by cigarette smoking (Gupta & Asma, 2008). Bidis or beedis or biris are slim, hand rolled, unfiltered form of smoking tobacco.

According to the National Family Household Survey-3, conducted in India in the years 2005-2006, 32.7% of males and 1.4% of females smoke bidis or cigarettes in the age group of 15-54 years (WHO, 2008). This means that approximately 30 % of women in India in the reproductive age group are passive smokers, exposed largely to bidi smoke.

Passive smoking is the involuntary consumption of smoked tobacco. There are two forms of passive smoking. "Second–hand smoke" is passive consumption, when the burning end is still present. Environmental tobacco smoke or "third-hand smoke", is the consumption of smoke that remains after the burning end is extinguished (Tobacco smoking, 2010). Due to its negative implications, this form of consumption has played a central role in the regulation of tobacco products. Asmussen (1977; 1978) conducted electron microscopic studies on human placentae of fullterm gravida. In the smokers he found a broadening of the basement membrane of the placental villi, increased collagen content of the villi, decreased vascularity, and intimal changes in the villous capillaries and arterioles with pronounced intimal oedema. Rath et al (2011) studied the morphology and did morphometric analysis of stromal capillaries in full term placental villi of smoking mothers and revealed that endothelial cells of placental villi of stromal capillaries were oedematous, and the cytoplasm was rich in dilated endoplasmic reticulum, mitochondria, fibrils and fine filaments in active as well as passive smokers. Morphometric analysis showed a decrease in the perimeter and area of the stromal capillaries, but an increase in number of capillaries per villus in passive smokers. Passive exposure to tobacco smoke, besides having adverse effects on the respiratory and cardiovascular system of the expectant mother, can affect placental tissue directly or indirectly by causing vasoconstriction of maternal vessels.

There is a relative paucity of research on effects of passive smoking on the placenta. Therefore, the present study was undertaken to observe the effect of passive smoking on stromal capillaries of terminal villi of placentae by the light microscope.

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Material and Methods:

One hundred and fifty placentae were collected immediately after delivery (36-42 weeks of gestation) from the Department of Obstetrics and Gynaecology, Subharti Medical College, Meerut. Out of these 150

placentae, 63 were collected from healthy gravidas with no history of exposure to tobacco smoke, or consumption of tobacco in any form, and were labelled as controls. Eighty seven placentae were collected from passive smokers mostly exposed to bidi smoke. A gravida exposed to 1 smoker smoking over a packet a day, or 2 or more smokers combined smoking at least 10 cigarettes or beedis a day, was labelled as passive smoker (Luciano et al, 1998).

Immediately after the expulsion of the placenta, the umbilical cord was cut 5 cms away from the site of the insertion, and membranes were trimmed. The clots were removed from the maternal surface and it was gently blotted dry with filter paper. This was followed by immersion & fixation of the placentae in 10% buffered formalin (pH 7).

Exclusion Criteria:

1. Gravida with IDDM or NIDDM, gestational diabetes, essential hypertension or pregnancy induced hypertension.
2. Gravida who actively consumed tobacco in any form;(e.g. cigarettes, bidis, paan, zarda, as tooth powder, hookah, etc)
3. Gravida with exposure to hookah smoke as it is difficult to quantify tobacco used in such cases.

From the maternal surface of the placental disc, 1 cm thick sections, one from the centre and one from the periphery, were taken and fixed in neutral buffered formalin for 24 hours. Routine processing was carried out for preparation of paraffin blocks. Three micron thick sections were cut and stained with Haematoxylin & Eosin. Histological parameters were observed under trinocular light microscope with attached digital camera, (Nikon Eclipse E-200), and photomicrographs were taken with the help of Q capture software.

Capillary lumen and vasculosyncytial membrane were studied in detail; a total of 100 villi per slide were observed.

Results:

The capillary lumina of the terminal villi were irregular in approximately 9% of passive smoking group (Table I). An irregular capillary lumen was characterised by protrusion of endothelial cells into the lumen (Fig. I).

Approximately 36% of terminal villi in the passive smoking group had absence of vasculosyncytial membrane (Fig. III). The vasculosyncytial membrane appeared as a thin amphophilic line formed by cytoplasm of syncytiotrophoblast, trophoblastic basement membrane, capillary basement membrane and a thin layer of intervening stroma (Fig. II).

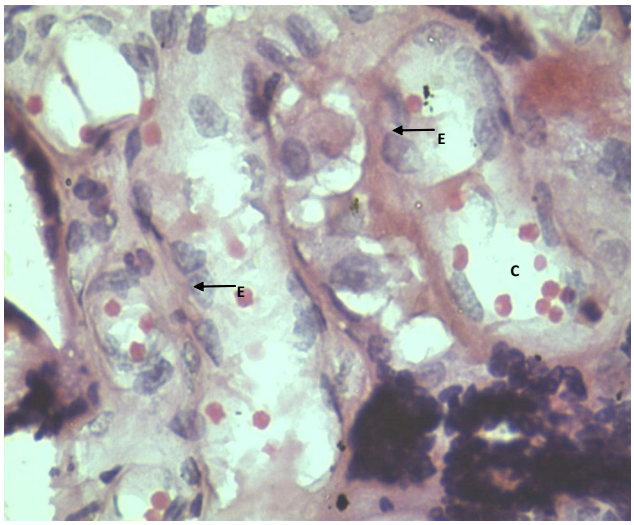

Fig. I: Photomicrograph of placenta of passive smoker group showing irregular capillary lumen (C) with protrusion of endothelial cell (E; H&E, 400X).

Discussion:

As placenta is the most important organ between mother and fetus during prenatal period, the toxic effect of nicotine may be manifested in it (Lieberman et al, 1994). It is likely that chronic exposure to tobacco constituents in early pregnancy can affect placental development directly or indirectly by reducing blood flow, which creates a pathologically hypoxic environment.

An irregular capillary lumen was found in 8.74±8.04 per 100 terminal villi of passive smokers in the present study as compared to 5.28± 4.01 per 100 terminal villi in the control group. Asmussen (1977;1978) observed intimal changes in villous capillaries and arterioles with pronounced intimal oedema in smoker's placentae. Burton et al (1989)

Table I: Table showing mean and standard deviation in the 2 groups, and probable values of unpaired t-test for the different histologic parameters.

Histopathological parameter	Passive smokers group mean± SD	Control group mean± SD	Probable values of *t*-test unpaired
Irregular capillary lumen	8.74±8.04	5.28±4.01	<0.0001
Absens of vasculosyncytial membrane	35.62±32.82	15.68±15.86	<0.0001

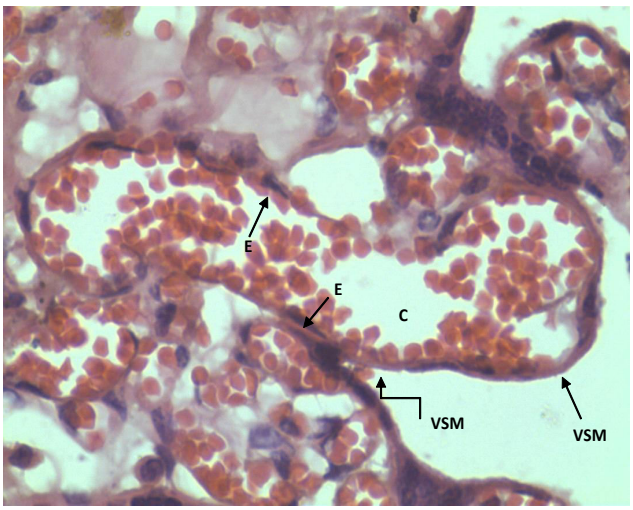

Fig. II: Photomicrograph of placenta of control group showing a regular capillary lumen (C) with flattened endothelial cells (E) and presence of vasculosyncytial membrane (VSM; H&E, 400X).

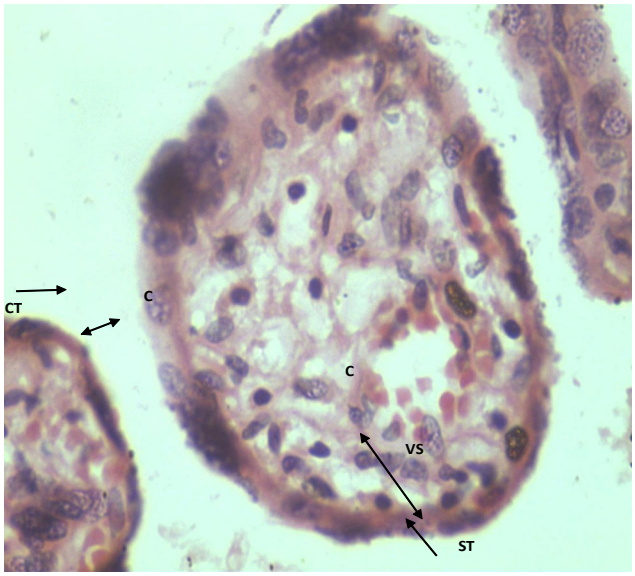

Fig. III: Photomicrograph of terminal villus of placenta of passive smoker group showing absence of vasculosyncytial membrane due to thick placental barrier (↔) with nucleus of syncytiotrophoblast (ST) cytotrophoblasts (CT) and villous stroma (VS) intervening between capillary basement membrane and intervillous space (H&E, 400X).

studied placental vasculature of smokers. They observed that even in heavy smokers the fetal capillaries were well perfused and possessed smooth regular outlines and a normal endothelium. This difference could be attributed to the perfusion fixation technique adopted by them in contrast to immersion fixation adopted in the present study and by most of other workers. They claim that perfusion fixation re-dilates the vessels to their *in vivo* dimensions. A standard pressure of 50 mm Hg was used for perfusion. Since fetal blood pressure measurement at term was not available for women who smoked, the possibility of error in their study due to under or over distension of the fetal vessels should be considered.

The vasculosyncytial membrane was absent in 35.62±32.82 per 100 terminal villi of passive smokers as compared to 15.68±15.86 per 100 terminal villi of the control group of the present study. The vasculosyncytial membrane (VSM) is considered to be the principal site for gaseous transfer. It is the area of cytoplasm of syncytiotropho-blast in close approximation with capillary endothelium, there being minimal stroma between capillary and trophoblast basement membranes. Similarly, Van der Veen & Fox (1982) also found a paucity of VSM in terminal villi of women who smoked.

The placenta serves as an important conduit of nutrients and some toxic metabolites like nicotine and carbon monoxide from the mother to the developing fetus. Nicotine is a powerful vasoconstrictor (Liebhart, 1974). Passive exposure to tobacco smoke causes uterine vasoconstriction, which in turn results in under perfusion of the placenta. Under perfusion of the placenta results in placental hypoxia, which in turn may be responsible for majority of the changes observed. Endothelial cells exposed to anoxic stress, show increase in levels of nitric oxide (NO) and the expression of inducible nitric oxide synthase (iNOS), cycloxygenase-2 (COX-2) and tumour necrosis factor-α (TNF α), molecules associated with endothelial dysfunction and vascular diseases (Palmieri et al, 2012).

Vascular changes in terminal villi could well be an indication of similar changes having occurred in other vessels of the newborn, which could be a harbinger of sequelae like atherosclerosis later in life (Asmussen, 1979).

In the present study oedema of endothelial cells was observed resulting in irregular capillary lumina, and absence of vasculosyncytial membrane in a significant number of villi in passive smokers even at the light microscopic level.

Therefore, in view of these observations it would be prudent to advise family members and other close associates of an expectant mother to abstain from smoking in the interests of the unborn child.

References:

1. Asmussen I: Fetal cardiovascular system as influenced by maternal smoking. *Clinical Cardiology*, 1979;2(4): 246-256.

2. Asmussen I: Ultrastructure of human umbilical veins: observations on veins from newborn children of smoking and non-smoking mothers. *Acta Obstetricia et Gynecologica Scandinavica*, 1978; 57(3):253-255.
3. Asmussen I: Ultrastructure of the human placenta at term: Observations on placentae from newborn children of smoking and non-smoking mothers. *Acta Obstetricia et Gynecologica Scandinavica*, 1977;56(2):119-126.
4. Burton GJ, Palmer ME, Dalton KJ: Morphometric differences between the placental vasculature of non-smokers, smokers and ex-smokers. *The British Journal of Obstetrics & Gynaecology*, 1989;96(8):907-915.
5. Gupta PC, Asma S. (Eds) Bidi smoking and public health. Ministry of Health and Family Welfare, Govt of India. Nirman Bhawan, New Delhi, 2008.
6. Lieberman E, Gremy I, Lang JM, Cohen AP: Low birth weight at term and the timing of fetal exposure to maternal smoking. *American Journal of Public Health*, 1994; 84(7):1127-1131.
7. Liebhart M: Polysaccharide surface coat (glycocalix) of human placental villi. *Pathologia Europaea*, 1974;9:3-10.
8. Luciano A, Bolognani M, Biondani P, Ghizzi C, Zoppi G, Signori E: The influence of maternal passive and light active smoking on intrauterine growth and body composition of the newborn. *European Journal of Clinical Nutrition*, 1998;52(10):760-763.
9. Palmieri D, Aliakbarian B, Casazza AA, Ferrari N, Spinella G, Pane B, Cafueri G , Perego P, Palombo D: Effects of polyphenol extract from olive pomace on anoxia-induced endothelial dysfunction. *Microvascular Research*, 2012;83(3):281-289.
10. Rath G, Dhuria R, Salhan S, Jain AK: Morphology and morphometric analysis of stromal capillaries in full term human placental villi of smoking mothers: an electron microscopic study. *La Clinica Terapeutica,* 2011;162(4): 301-305.
11. Tobacco smoking-Wikipedia, the free encyclopedia. URL:htpp://en.wikipedia.org/wiki/Tobacco_smoking. 2010.
12. Van der Veen F, Fox H: The effects of cigarette smoking on the human placenta: a light and electron microscopic study. *Placenta,* 1982;3(3):243-256.
13. WHO Report on the Global Tobacco Epidemic, MPOWER package 2008.

Source of Support : Nil.
Conflict of Interest: None declared.

Research Article

Role of Rabeprazole on Chest Discomfort of Uncertain Origin

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(Received November, 2012) (Accepted April, 2013)

Abstract:

Chest discomfort is a common challenge to clinicians; conditions vary from benign to life threatening. The differential diagnosis includes and overlaps cardiovascular, respiratory, gastrointestinal, neuromusculoskeletal & psychiatric problems, all requiring careful history and thorough investigations. However, a significant number of cases remain undiagnosed despite meticulous investigations and thus require empirical therapy (Fagring et al, 2005; Thomas, 2012). The present study was aimed to find the effect of one of the Proton-pump inhibitors (PPIs; Rabeprazole) on patients having non-traumatic, non severe chest discomfort, diagnosis of which could not be confirmed. Forty eight eligible patients were divided into 2 groups: PPI group and placebo group. Before and after 4 weeks of therapy, they were studied with visual analog scale for pain and its frequency, duration and intensity. Rabeprazole treated patients responded much better than the placebo group. Seventy five percent were pain free or had appreciable relief in pain intensity after 4 weeks. In contrast to Rabeprazole group, in placebo group none became pain free; 45 % had marginal relief while 55 % derived no benefit. Proton-pump inhibitors are of value in the treatment of non specific chest discomfort.

Key Words: Rabeprazole, Nonspecific Chest discomfort.

Introduction:

Chest discomfort is one of the most common reasons for people to seek healthcare advice (Cayley, 2005). In most cases of clinical presentation, a thorough history taking followed by meticulous physical examination is a must. In patients with non-traumatic chest discomfort, most clinicians appear to rely on a process of '*pattern recognition*' for most of the time. In this diagnostic approach patients are fitted to 'prototypes' of disease that are developed and held in the clinician's mind, and which are subject to modification in the light of clinical examination, subsequent laboratory investigations and further development (Pottle, 2005; Ryan et al, 2002). These include:

1. Pain on exertion: indicates cardiovascular pathology, especially when their primary symptom is gripping chest discomfort (Pope et al, 2000).
2. Presence of indigestion: indicates gastrointestinal pathology and in most cases the differences between cardiac and esophageal pain can be discerned clinically, although this is problematic in 20% of instances (Bennett, 2001).
3. Presence of sharp pain and chest wall tenderness: which is often more characteristic of pulmonary conditions and musculoskeletal pain.
4. Pain confined to particular area or dermatome: may be a sign of post or evolving herpetic neuralgia (Dubinsky et al, 2004).
5. Associated emotional distress: may indicate functional basis (Bass & Mayou, 2002).

In some cases symptoms tend to overlap. These cases require a plethora of tests. Some of the investigation modalities that have to be employed to reach to any conclusion are Routine Electro Cardiograph (ECG), stress ECG and ECHO cardiography for any cardiac cause; Barium meal and pH manometry for gastrointestinal cause; chest X-ray and Computerized Tomography (CT) for lung pathology and musculoskeletal problem; psychological evaluation if there is a hint of depression in family. However, in a significant number of cases the cause does not become obvious despite careful history and meticulous examination.

The present study was confined to these non severe chest discomfort cases, cause of which was uncertain.

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Material & Methods:

Selection of patients:

The study was performed at a tertiary care hospital in Kanpur from May 2011 to Sept 2012. After approval of institute's ethics committee, an informed consent was discussed, approved and signed by all volunteers. All these participants were between 18 to 45 years of age, non alcoholic, non smoker and were otherwise healthy but with complain of non traumatic non severe chest discomfort. These cases were intensively scrutinized and allocated to respective clinical department depending on the cause ascertained. Those in which diagnosis was uncertain, were taken up for this study. A total of 62 such cases were included for the present study.

Participants thus selected were randomly assigned to take either 40 mg of Rabeprazole or a similar looking inert tablet daily.

Patients were asked for symptoms and were helped to grade the frequency, duration and particularly the intensity using the characteristics (Table I, Fig. I).

Faces rating scale (FRS):

Participants who had difficulty using the numbers on the visual/numerical rating scale were assisted with the use of the six facial expressions suggesting various pain intensities. They were asked to choose the face that best described how they felt. Here the far left face indicates 'No hurt' and the far right face indicates 'Hurts worst'. Number corresponding to the face chosen was documented.

These participants were asked to report after 1 & 4 weeks and were tested again on the same scale.

The data thus obtained was evaluated by using the statistical Package for Social Science (IBM SPSS v. 20). A Wilcoxon Signed ranks test was used to analyze the percentage change.

Results:

Out 62 cases enrolled for the present study, only 48 participants completed the study; 28 in the Rabezaprole group and 20 the in placebo group. After a week of therapy these participants were again put to visual analog scale; 7.2% became pain free in Rabeprazole group; 21.4% had some relief while rest 71.4% had no relief in pain intensity. Compared to this in placebo group none became pain free, 25% had some relief, rest 75% had no relief. All these participants were counselled to continue their "medication" for another 3 weeks.

After a total of 4 weeks of therapy, study results were much more encouraging. Rabezaprole treated patients responded much better than the placebo group. Five patients became absolutely pain free (17.86%), 8 patients were almost pain free (28.57%).

Table I: Definitions of grades in visual analogue scale (characteristics of symptoms).

Grade	Frequency	Duration	Intensity
10	Permanent	Permanent	
9	Several times daily	Almost whole day	
8	Daily	More than 6 hours	
7	Almost daily	More than 2 hours	
6	Several times weekly	About 1 hour	
5	Upto 3 times weekly	10-30 minutes	Grading by points on a scale from 0 to 10
4	Once weekly	5-10 min.	(Face rating scale)
3	Several times in 1 month	1-5 minute	
2	Up to 3 times in 1 month	Less than 1 minute	
1	Once per month	A few seconds	
0	Never or very seldom	Never	

Fig. I: Showing face rating scale for Intensity of pain.

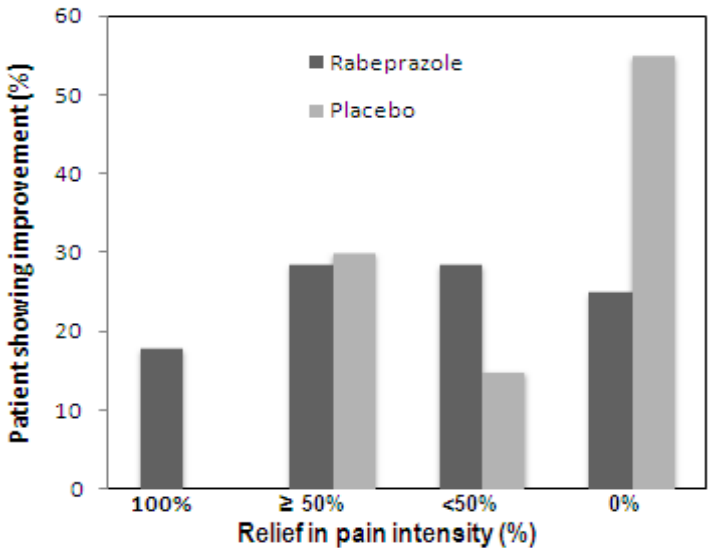

Fig. II Change in Chest discomfort intensity during treatment in Rabeprazole and placebo groups

Table II: Change in Chest discomfort parameters during treatment in Rabeprazole and placebo groups.

	Rabeprazole (n=28)				Placebo (n=20)			
Change in Chest discomfort	At baseline	After 4 weeks	z value	p-value	At baseline	After 4 weeks	z value	p-value
Frequency	7.00±1.3	4.57±2.8	-3.398	0.001	6.45±1.3	6.25±1.0	-1.069	0.285
Duration	4.93±1.2	3.86±2.2	-2.596	0.009	5.30±1.5	4.00±1.9	-2.128	0.033
Intensity	3.89±1.3	2.25±1.7	-4.059	<0.001	4.15±1.0	3.35±1.4	-1.688	0.091

Other eight had appreciable relief in pain intensity (28.57%), 7 patients however did not had any benefit (25%). Compared to this, in placebo group none became absolutely pain free (0 %), 6 (30%) reported that they are much better, 3 (15%) had some relief while 11 patients (55%) had no improvement or complained of worsening of symptoms (Fig. II & Table II).

Discussion:

Chest discomfort is a symptom most commonly associated with heart disease, but it may also be present in many different disease processes (Fass & Navarro-Rodriguez, 2008).Objective findings from the physical examination of the cardiovascular and peripheral vascular systems along with results of investigations support or refute each differential diagnosis for a patient who presents with chest discomfort. No system is exempt from evaluation outside of the context of the full examination (Seidel et al, 2003). It is true to say that the majority of the diagnosis is based on the patient's history and the clinical examination. The chief aim for a clinician is to rule out any serious life threatening malady and there, the role of investigation cannot be underestimated. How can one rule out "Cardiac Syndrome X" (Crea & Lanza, 2004) without a stress ECG or an aneurysm without CT thorax (Klompas, 2002)? However, even in most optimum setting the diagnosis remain uncertain in some of the cases, more so if the chest discomfort is sub acute. These cases tax the resourcefulness of treating clinician as they do not have the remotest idea how to approach these patients. They usually follow the strategy of ROAST (rule out all serious things). Reassurances that there is nothing serious, anxiolytics, sedatives, antacids and psychotherapy (Esler & Bock, 2004) are usually offered. Randomized trial data indicate that cognitive therapy and group interventions lead to decrease in symptoms for such patients. Easier said than done

One of the trials took 12 months to produce a positive outcome in only 48% of cases (van Peski-Oosterbaan et al, 1999). Compared to this the present study showed a positive outcome in 75 % of cases and that too in just one month. Most of other trials are not clear about the length of therapy and percentage of positive outcomes.

Proton-pump inhibitors (PPIs) are the class of drugs which inactivates H+/ K+ ATP ase (proton pump) in gastric parietal cells which is the final pathway of acid production in stomach. They are very routinely prescribed and has very satisfactory safety profile. In certain condition, they also promote release of abundant quantity of pituitary mediated β-endorphin, a powerfull nociceptive and an endogenous opioid (Jarmukli et al, 1999). Omeprazole was reported to be 100 times more effective than placebo in release of β-endorphin, thus having a potent antinociceptive property (Budzyñski et al, 2010). Similar results were observed with Rabeprazole (Dickman et al, 2005) and Lansoprazole (Bautista et al, 2004). It is suggested that both, these mechanism of action produced amelioration of symptoms in the present study either individually or synergistically as some of the patients might be suffering from transient acid reflux phenomenon even if not proved by suitable investigations. The present study clearly demonstrates that in these baffling cases of chest discomfort a fair trial with Rabeprazole is warranted.

Conclusion:

The result of this study clearly proves the superority of Rabeprazole (40 mg OD) over placebo in management and treatment of nonspecific non acute chest discomfort due to its gastric acid suppressive and β-endorphin release property and a course of PPI in these cases is suggested.

References:

1. Bass C, Mayou R: Chest pain. *British Medical Journal,* 2002; 325(7364): 588–591.
2. Bautista J, Fullerton H, Briseno M, Cui H, Fass R: The effect of an empirical trial of high-dose lansoprazole on symptom response of patients with non-cardiac chest pain-a randomized, double-blind, placebo controlled, crossover trial. *Alimentary Pharmacology Theraputics,* 2004; 19(10): 1123-30.
3. Bennett J: Oesophagus: atypical chest pain and motility disorder. *British Medical Journal*, 2001; 323(7316): 791–794.
4. Budzyñski J, Pulkowski G , K Lopocka M, Augustyñska B, Sinkiewicz A, Suppan K, Fabisiak J, Majer M, Swiatkowski M: Treatment with double dose of omeprazole increases β-endorphin plasma level in patients with coronary artery disease. *Archives of Medical Sciences,* 2010;6(2): 201-207.
5. Cayley WE (Jr.): Diagnosing the cause of chest pain. *American Family Physician.,* 2005; 72(10): 2012–2021.
6. Crea F, Lanza GA: Angina pectoris and normal coronary arteries: cardiac syndrome X. *Heart,* 2004; 90(4): 457–463.
7. Dickman R, Emmons S, Cui H, Sewell J, Hernández D, Esquivel RF, Fass R: The effect of a therapeutic trial of high-dose rabeprazole on symptom response of patients with non-cardiac chest pain: a randomized, double-blind, placebo-controlled, crossover trial. *Alimentary Pharmacology & Therapeutics,* 2005; 22(6): 547-555.
8. Dubinsky RM, Kabbani H, El-Chami Z, Boutwell C, Ali H: Practice parameters: treatment of postherpetic neuralgia: an evidence-based report of the Quality Standards Subcommittee of the American Academy of Neurology. *Neurology,* 2004; 63(6): 959–965.
9. Esler JL, Bock BC: Psychological treatments for noncardiac chest pain: Recommendations for a new approach. *Journal of Psychosomatic Research,* 2004; 56(3): 263-269.
10. Fass R, Navarro-Rodriguez T: Noncardiac chest pain. *Journal of Clinical Gastroenterology,* 2008; 42(5): 636-646.
11. Fagring AJ, Gaston-Johansson F, Danielson E: Description of unexplained chest pain and its influence on daily life in men and women. *European Journal of Cardiovascular Nursing,* 2005; 4(4): 337–344.
12. Jarmukli NF, Ahn J, Iranmanesh A, Russell DC. Effect of raised plasma beta endorphin concentrations on peripheral pain and angina thresholds in patients with stable angina. *Heart,* 1999; 82(2): 204-209.
13. Klompas M: Does this patient have an acute thoracic aortic dissection? *The Journal of the American Medical Association,* 2002; 287(17): 2262–2272.
14. Pope JH, Aufderheide TP, Ruthazer R, Woolard RH, Feldman JA, Beshanskj JR, Griffith JL, Selker HP: Missed diagnoses of acute cardiac ischaemia in the emergency department. *New England Journal of Medicine,* 2000; 342(16): 1163–1170.
15. Pottle A: A nurse-led rapid access chest pain clinic – experience from the first 3 years. *European Journal of Cardiovascular Nursing,* 2005; 4(3): 227–233.
16. Ryan J, Heyworth J, Eslick G, Coulshed D: Rapid assessment of chest pain. *British Medical Journal,* 2002; 324(7334): 422.1.
17. Seidel HM, Ball JW, Dains JE, Benedict WG:

Mosby's Guide to Physical Examination, 5th Edn.; Mosby, St Louis, 2003.

18. Thomas HL: Chest discomfort & Palpitation. In: Harrison's Principles of Internal Medicine (Vol. I). DL Kasper, AS Fauci , D L Longo, E Braunivald, SL Hauser, JL Jameson: (Eds.); 18th Edn.; McGraw-Hill Medical Publisher Division , New York, 2012. pp.102-107.
19. van Peski-Oosterbaan AS, Spinhoven P, van Rood Y, van der Does JW, Bruschke AV, Rooijmans HG: Cognitive-behavioral therapy for noncardiac chest pain: a randomized trial. *The American Journal of Medicine*, 1999;106(4):424-429.

Source of Support : Nil.
Conflict of Interest: None declared.

Research Article

Isolation, Identification and Prevelance of Dermatophytes in Tertairy Care Hospital in Gulbarga District.

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(Received December , 2012) (Accepted May, 2013)

Abstract:

Dermatophytosis is one of the most commonly encountered cutaneous fungal infections worldwide. The higher prevalence in tropical and subtropical areas is supposedly due to the hot and humid climatic condition. Other factors like personal hygiene and habits, prevalence of virulent species in the soil are also known to influence the infection. A high prevalence of dermatophytoses has been reported from India. Hence, this study was undertaken to identify, speciate and study the sensitivity pattern of dermatophytosis from clinical samples received at Basveshwar Teaching & General Hospital, Gulbarga.

A total of two hundred clinically diagnosed randomly selected patients of dermatophytosis attending the out patient department of Dermatology and Venereology, Basveshwar Teaching & General Hospital & M.R. Medical College, Gulbarga were studied. Skin, nail and hair specimens taken from the patients were processed by potassium hydroxide preparation (KOH) for direct microscopy and culture.

Dermatophytosis was more common in the age group of 21-30 years (36%) and in males (73%). Fungi was demonstrated in 130 cases by KOH and in 96 cases by culture; 78 cases were positive by both direct examination and culture. Tinea corporis was the commonest clinical type encountered (54.5%) followed by tinea cruris (25.5%). Tricophyton rubrum (46.87%) was the commonest aetiological agent in majority of clinical types followed by Trichophyton mentagrophytes (36.46%), Microsporum gypseum (4.16%), Trichophyton tonsurans (1.04%) , Epidemophyton floccosum (8.33%). Microsporum audouinii (2.08%) and Trichophyton violecium (1.04%).

Dermatophyte infections are very common in our country where hot and humid climate along with poor hygienic conditions play an important role in the growth of these fungi. By and large, Trichophyton species forms the commonest etiological agent of dermatophytosis. Tinea rubrum was the commonest isolate in tinea corporis, tinea cruris and Onychomycosis. Microporium audouinii was isolated from 1 case of tinea capitis.

Key Words: Dermatophytes, Dermatophytosis, Tinea corporis, Tinea cruris, T. rubrum.

Introduction:

Dermatophytosis are the most common types of cutaneous fungal infections seen in man affecting skin, hair, and nails, in both developed and developing countries due to advent of immunosuppressive drugs and diseases. Hot and humid climate in the tropical and subtropical countries like India makes dermatophytosis or ringworm infection as a very common superficial fungal infection (Singh & Beena, 2003). The dermatophytes are keratinophilic fungus, which causes dermatophytosis by virtue of their unique ability to degrade keratin and thus colonize and invade the skin and its appendages.

Depression of cellular immunity due to various factors such as malignancy, administration of steroids or immunosuppressive drugs, endocrine disorders such as Cushing's disease, can lead to atypical generalised invasive dermatophyte infection. Early identification and treatment is essential as once infection is established, the individual becomes carrier and more susceptible to recurrence (Padhye & Weitzman, 1998).

Any clinical diagnosis need to be supported by laboratory diagnosis. Culture is a necessary adjunct to direct microscopic examination for definitive identification of etiological agent. In many instances the choice of therapy may depend upon the specific identification of invasive mould. This is especially important in the nail and skin infection, often caused by non-dermatophytic filamentous fungi which are often resistant to usual dosage of the therapy used for dermatophytic infection (Padhye & Weitzman, 1998).

Rapid identification of dermatophyte species and knowledge of their host preference and ecology play an important role in epidemiology, public health issue and infection control. The varied clinical presentation of tinea, which results in delay in diagnosis, poor compliance in follow up of cases, and consequently

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spread of infection in the community had rekindled interest in rapid diagnostic method in identification of species (Padhye & Weitzman, 1998).

Material and Methods:

Two hundred clinically diagnosed cases of Tinea attending the Dermatology & Venereology O.P.D at Basaveshwar Teaching and General Hospital & M.R. Medical College, Gulbarga were included in the study.

Depending on the clinical types and lesions, specimens comprised of skin scrapings, nail scrapes / clippings and infected hair stubs. These samples were collected and processed as per standard guidelines (Padhye & Weitzman, 1998; Chander, 2000).

Following culture procedures and tests were carried out for identification and specification of dermatophytes (Padhye & Weitzman, 1998; Hay & Ashbee, 2010; Emmons et al, 1970; Rippons, 1988).

1. Direct Microscopic examination (KOH mount; Chander, 2009)
2. Culture:Specimens were then cultured irrespective of KOH findings. 3 sets of medium were used: a) Sabourauds dextrose agar (Modified); b) Sabourauds dextrose agar with cycloheximide and chloramphenicol are incorporated to avoid contamination with saprophytic fungi and bacteria; c) Dermatophyte test medium
3. Other test performed were: Lacto phenol cotton blue mount; Slide culture technique (Riddel Slide culture Method); Urease Test; Rice Grain Test and Hair perforation test.

Results:

The highest incidence was found in the age group of 21-30 years followed by age group of 11-20 years. Tinea corporis and Tinea cruris infections were also maximum in this age group. Male and female ratio was approximately 2.7:1. Incidence of tinea cruris was found to be very low in females (3.9%).

Clinical types : Tinea corporis formed the major group (54.5%), followed by tinea cruris (25.5 %), onychomycosis (9.5%), tinea pedis (6%), tinea barbae and tinea manuum (2%). Tinea capitis (0.5 %) was the least common type (Table I).

Microscopy and culture: Out of the 200 cases of dermatophytosis, 130 were positive in direct examination (KOH) and a total of 96 were positive by culture. 78 cases were positive in direct examination (KOH) as well as in culture. In 18 cases, even though direct examination was negative, they were positive by culture. 52 cases were negative both in direct examination and culture (Table II).

Table I: Incidence of various types of dermatophytes isolated.

Clinical types	Number of cases	Percentage
Tinea corporis	109	54.5%
Tinea cruris	51	25.5%
Tinea pedis	12	06%
Tinea barbae	04	02%
Tinea mannum	04	02%
Tinea capitis	01	0.5%
Onychomycosis	19	9.5%

Table II: Showing results of Direct examination & culture.

Culture	Number of cases		Total
	KOH +ve	KOH –ve	
Culture positive	78	18	96
Culture negative	52	52	104
Total	130	70	200

Clinical type and aetiological agents: Out of the 176 cases of skin scrapings, 88(50 %) were positive in culture. All the hair samples 5 (100%) yielded positive culture. Out of the 19 nail samples from onychomycoses cases only 3 yielded positive growth (Table III).

Majority of the isolates belong to the Trichophyton species. Trichophyton rubrum was found in 46.8% followed by T. mentagrophyte (36.46%), E. floccosum (8.3%), M. gypseum (4.16%), M. audouinii (2.08%); T. tonsurans and T. violesium were found in 1.04% each (Table V).

The details of the clinical type and their relation to the aeitological agents are shown in table IV. Most of the Tinea corporis cases were found to be due to T. rubrum and T. mentagrophyte. Other species were E. floccosum, M.gypseum and T tonsurans. Tinea cruris was mostly caused by T. rubrum, T. mentagrophyte and E. floccosum.. Species isolated from tinea pedis, tinea manuum and tinea unguium were T. rubrum and from tinea capitis was M. audouinii.

Discussion:

The present study revealed that dermatophytosis is more common in the age group of 21-30 years (36%) followed by 11-20 years (19%), which is in accordance with studies of Jesudanam et al (2002), Sen & Rasul (2006) and Mishra et al (1998).

Table III: Showing type of specimen and aetiological agent isolated

Specimen	No. of cases	Fungal species	Percentage (positive)
Skin scrapings	176	Trichophyton rubrum ,Trichophyton mentagrophyte Epidermophyton floccosum, Trichophyton tonsurans & Microsporum gypaeum	50%
Hair stubs	5	Trichophyton rubrum Trichophyton mentagrophyte & Microsporum audouinii	100%
Nail scarping and clipping	19	Trichophyton rubrum, T.violecium	15.7%

Table IV: Showing clinical type in relation to aetiological agents

Aetiological agent	Tinea corporis	Tinea cruris	Tinea pedis	Tinea manuum	Tinea barbae	Tinea capitis	Onychomycosis	Total	%
T.rubrum	27	10	2	2	2	0	2	45	46.87
T.mentagrophyte	25	8	0	0	2	0	0	35	36.46
T.tonsurans	1	0	0	0	0	0	0	1	1.04
T.violecium	0	0	0	0	0	0	1	1	1.04
E.floccosum	4	4	0	0	0	0	0	8	8.33
M.gypseum	4	0	0	0	0	0	0	4	4.16
M.audouinii	0	0	1	0	0	1	0	2	2.08
Total	61	22	3	2	4	1	3	96	

Table V: Percentage of species of Dermatophyte isolated.

Species	Number of isolates	Percentage
Trichophyton rubrum	45	46.87
Trichophyton mentagrophyte	35	36.46
Trichophyton tonsurans	1	1.04
Trichophyton violecium	1	1.04
Epidermophyton floccosum	8	8.33
Microsporum gypseum	4	4.16
Microsporum audouinii	2	2.08

However, Veer et al (2007) has reported that the most common age group affected was 31-40 years followed by 41-50 years.

The highest incidence in young adults aged 21-30 years may be due to increased physical activity and increased chances of exposure to infection.

In the present study, males (73%) were more frequently affected than females (27%). Male to female ratio was 2.7:1. Out of 200 clinically diagnosed cases of dermatophytosis, 130 cases were positive for fungi by KOH. Seventy eight cases were positive by both KOH and culture, 52 cases were positive by KOH and negative by culture, 18 cases were negative by KOH but culture positive, 52 cases were negative by both KOH but culture, which is comparable with the study of Singh & Beena (2003). KOH positive and culture negative could be due to non-viability of fungal elements in some cases.

In the present study T. rubrum (46.87%) was the commonest aetiological agent in majority of clinical types followed by T. mentagrophytes (36.46%), E. floccosum (8.33%), M. gypseum (4.16%). In tinea capitis, M.audounii was isolated in 1 case, which was not isolated in studies by Bindu & Pavithran (2002) and Venkatesan et al (2007). However, Karmakar et al, (1995) and Fathi & al-Samarai (2000) in their study, reported T. violaceum and T. verrucosum as the predominant isolates respectively.

Conclusion:

Dermatophyte infections are very common in our country where hot and humid climate in association with poor hygienic conditions play an important role in the growth of these fungi. There is a difference in isolation of different species from southern and northern part of India. By and large, Trichophyton species form the commonest aetiological agent of dermatophytosis.

All the clinically diagnosed fungal infections need to be confirmed by laboratory diagnosis for proper treatment of fungal infection and to know the prevalence of particular dermatophyte.

References:

1. Bindu V, Pavithran K: Clinico-mycological study of dermatophytosis in Calicut. *Indian Journal of Dermatology, Venereology & Leprology* , 2002; 68(5):259-261.
2. Chander J: Dermatophytoses. In: Textbook of Medical Mycology. 3rd Edn.; Mehta publication, New Delhi, 2009,pp.134-141.
3. Emmons CW, Chapman HB, John PU: Dermatophytoses. In: Medical Mycology. 2nd, Edn.; Henry Klipton Publishers, Great Britain,1970, pp. 109-120.
4. Fathi HI, al-Samarai AM: Tinea capitis in Iraq. *East Mediterranean Health Journal*, 2000;6(1):138-148.
5. Hay RJ, Ashbee HR: Mycology (Chapter 36). In: Rook's Text book of Dermatology (vol. II). B Tony, B Stephen , C Neil, G Christopher, (Eds.); 8th Edn.; Willey Blackwell, Oxford, 2010,pp.18-20.
6. Jesudanam TM, Ramarao GR, Lakshmi DJ, Kumari GR: Onychomycosis: A significant medical problem. *Indian Journal of Dermatology, Venereology & Leprology*, 2002;68(6):326-329.
7. Karmakar S, Kalla G, Joshi KR, Karmakar S: Dermatophytosis in a desert district of Western Rajasthan. *Indian Journal of Dermatology, Venereology & Leprology*, 1995; 61(5):280-283.
8. Mishra M, Mishra S, Singh PC, Mishra BC: Clinico-mycological profile of superficial mycoses. *Indian Journal of Dermatology, Venereology & Leprology*, 1998; 64(6):283-285.
9. Padhye AA, Weitzman I: The Dermatophytes. In: Topley & Wilson's Microbiology and Microbial Infection (Medical Mycology ;vol. IV) L Ajello, RJ Hay, L Collier, A Balows, M Sussman (Eds.); 9th Edn.; Arnold publication, Great Britain, 1998,pp.215-225.
10. Rippons JW: Pathogenic fungi and pathogenic actinomycetes. In: Medical Mycology. KJ Kwon Chung & JE Bennett: (Eds.); 3rd Edn.; WB Saunders Company, Philadelphia, 1988, pp.230-239.
11. Sen SS, Rasul ES: Dermatophytosis in Assam. *Indian Journal of Medical Microbiology*, 2006;24(1):77-78.
12. Singh S, Beena PM: Comparative study of different microscopic technique and culture media for isolation of dermatophytes. *Indian Journal of Medical Microbiology*, 2003; 21(1):21.24.
13. Veer P, Patwardhan NS, Damle AS: Study of onychomycosis: prevailing fungi and pattern of infection. *Indian Journal of Medical Microbiology*, 2007; 25 (1) :53-56.
14. Venkatesan G, Ranjit Singh AJA, Murugesan AG, Janaki C, Shankar SG: Trichophyton rubrum-the predominant aetiological agent in human dermatophytosis in Chennai, India. *African Journal of Microbiology Research,* 2007; 9-12.

Source of Support : Nil.
Conflict of Interest: None declared.

Research Article

Bony and Cadaveric Study of Retromolar Region

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(Received April, 2013) (Accepted June, 2013)

Abstract:

Retromolar area in the mandible has considerable surgical importance for dental surgeons. The anatomy of this area has not received much attention in standard texts of Anatomy. A variant foramen called retromolar foramen has been described in the literature. This foramen transmits a neurovascular bundle. Presence of this neurovascular bundle poses a risk in the surgical procedures carried out for impacted lower third molar tooth extraction. The dental surgeon should also be aware of occasional presence of this neurovascular bundle in retromolar area while infiltrating local anesthetic agents.

The present study was conducted on 71 dry mandibles and 10 cadaveric specimens. In dry mandibles, the boundaries and dimensions of retromolar trigone were studied. Prevalence of retromolar foramen was recorded. The distance of retromolar foramen, if present was recorded from posterior border of socket for third molar and second molar teeth respectively. In cadavers, retromolar areas were dissected and structures related were observed.

Key Words: Ramus of mandible, Retromolar foramen, Temporal crest, Third molar.

Introduction:

Retromolar area is in the form of a triangular depression, which can be seen between the temporal crest medially and the anterior border of ramus of mandible laterally. This is called as a retromolar fossa (Berkovitz, 2005).

A variant foramen called retromolar foramen (RMF) present in retromolar area, has also been described in literature (Ossenberg, 1987; Sawyer & Kiely, 1991). This foramen transmits a neurovascular bundle consisting of an artery, vein and a nerve. Knowledge of presence of this neurovascular bundle is very important for surgical procedures involving the retromolar area like impacted third molar tooth extraction (Schejtman et al, 1967; Kodera & Hashimoto, 1995). The occasional nerve present in this area provides additional supply to the mandibular molars. While infiltrating local anesthetic agents in the region of third molar, this fact should be borne in mind (Kodera & Hashimoto, 1995). Carcinoma in the mucosa of the retromolar trigone may require resection and radical dissection. Such surgery can put important structures at risk (McGregor & MacDonald, 1988; Goldie et al, 2006; Ayad et al, 2009).

Material and Methods:

In this study, 71 dry, fully ossified adult mandibles and 10 adult cadavers were included. Mandibles and cadavers with any congenital / acquired deformity of the region of interest were excluded. The edentulous mandibles and mandible with extracted third molar and resorbed third molar socket were excluded from the study. In dry mandibles, the boundaries and dimensions of retromolar fossa were demarcated with a pencil and measured with thread and a vernier caliper. Prevalence of retromolar foramen was documented. The minimum distance of retromolar foramen was recorded from posterior border of socket for third molar and second molar teeth respectively with the help of a digital vernier caliper. Retromolar areas was dissected and structures related to it were observed in cadavers.

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Observations:

The retromolar region in the dry mandibles was a triangular area bounded by temporal crest on the medial side, anterior border of ramus on the lateral side and base posterior to the socket for the third molar. Table I shows the dimensions of boundaries of retromolar trigone. Temporal crest formed the longest boundary.

Retromolar foramen was observed in 10 mandibles out of 71 studied (14.08 %). In 4 mandibles the foramen was observed on the right side and in 4 it was on the left side. In 2 mandibles it was observed bilaterally, in both these mandibles bilateral unerupted third molar teeth were also observed. The RMF was mostly located near the lower half of the temporal crest (Fig. I & II).

The minimum distance of RMF from the posterior border of third and second molars respectively

Table I: Showing dimensions of boundaries of retromolar trigone.

	Temporal Crest		Anterior Border of Ramus		Base	
	RIGHT	LEFT	RIGHT	LEFT	RIGHT	LEFT
Average	38.8mm	40.1mm	35.5mm	35.7mm	12.9mm	13 mm
Maximum	53mm	52.7mm	51mm	49.6mm	19mm	17.7mm
Minimum	22mm	22.1mm	21.5mm	19.2mm	08.4mm	07mm

Table II: Showing minimum distance of RMF from 2nd & 3rd molar tooth

	Minimum distance of RMF from the posterior border of third molar		Minimum distance of RMF from the posterior border of second molar	
	RIGHT	LEFT	RIGHT	LEFT
Average	08.7 mm	08.3 mm	18.7 mm	17.1 mm
Range	03.12- 13.07 mm.	03.31 -14.92 mm.	11.09 -22.38 mm.	10.81- 24.96 mm.

Table III: Showing comparisons of present study with other studies.

Researcher	Region of Population	Sample Size	Retromolar Foramen (%)				Distance of foramen from 3rd molar socket (mm)	
			Rt.	Lt.	Bilat.	Total	Rt.	Lt.
Sawyer & Kiely, 1991	-	234	-	-	-	7.7	-	-
Kodera & Hashimoto, 1995	Japan	41	-	-	-	19.51	-	-
Narayana et al, 2002	India Karnataka	242	10.7	7.1	4.1	21.9	-	-
Suazo et al, 2008	Brazil	294	-	-	-	12.9	-	-
Senthil Kumar & Kesavi, 2010	India	150	5.3	4	8	17.3	4.5	4
Present study 2011-12	India	71 & 10 cadavers	5.63	5.63	2.81	14.08	8.76	8.37

is shown in Table II. It was observed that when present the RMF was within a centimeter of the posterior border of third molar tooth. However, very closely placed RMF (3mm) were also observed.

On dissection, it was observed that the lateral boundary of retromolar triangle in its upper 1/3rd provided attachment to superficial fibers of temporalis muscle. The medial boundary of the triangle in its upper 2/3rd provided attachment to deeper fibers of temporalis muscle, especially those arising from anterior wall of temporal fossa (Fig. III). The medial border near its lower end was crossed by lingual nerve and in its middle was crossed by buccal nerve and artery (Fig. IV, V). Deep to the medial border, medial pterygoid muscle was seen. Along anterior border of medial pterygoid and anteromedial to the triangle, pterygomandibular raphe, gave attachment to buccinator anteriorly and superior constrictor muscle posteriorly. The raphe itself was attached to the posterior edge of third molar socket (Fig. VI). In these 10 cadaveric dissections (total 20 sides, 10 right & 10 left) no retromolar foramen could be seen.

Discussion:

Many dry bone studies documenting the prevalence of retromolar foramen have been carried out in India (Narayana et al, 2002; Senthil Kumar & Kesavi, 2010) and around the world (Ossenberg, 1987; Sawyer & Kiely, 1991; Kodera & Hashimoto, 1995; Bilecenoglu & Tuncer, 2006; Suazo et al, 2008;

Fig. I: Mandible with retromolar region demarcated, showing presence of retromolar foramen in proximity to temporal crest.

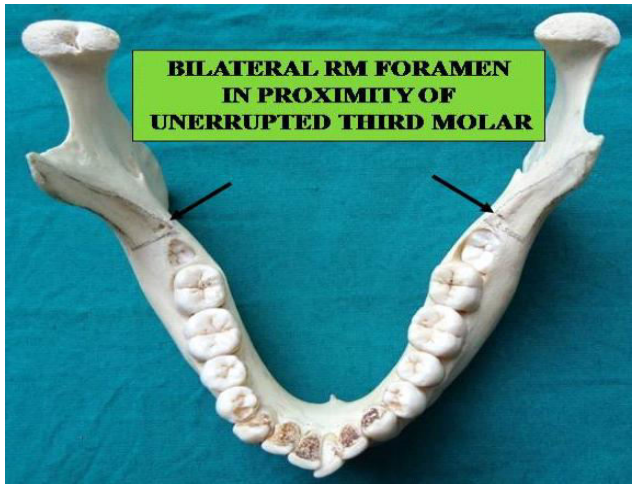

Fig. II: Mandible with bilateral retromolar foramina (arrows) and unerupted third molar teeth.

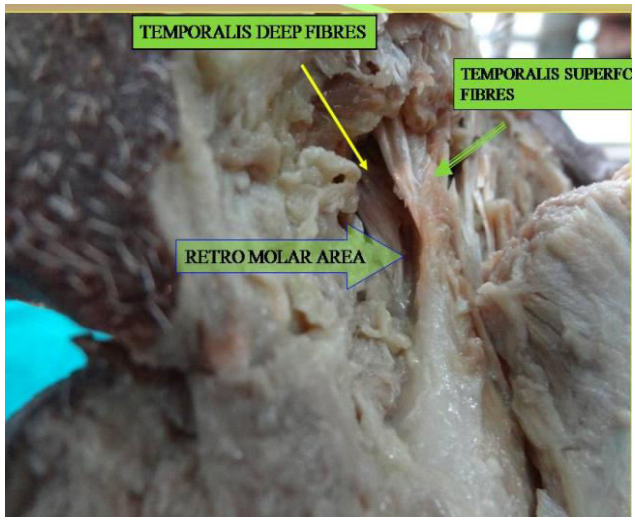

Fig. III: Lateral view of jaw showing attachment of superficial and deep fibers of temporalis muscle to the lateral and medial boundaries of the retromolar area respectively.

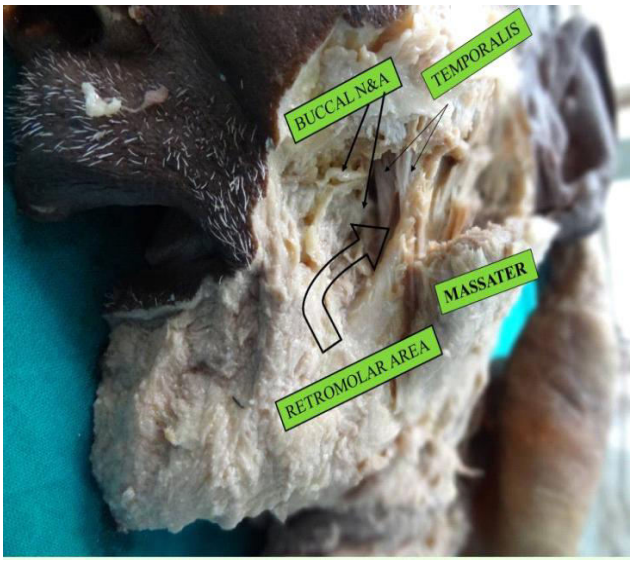

Fig. IV: Lateral view of jaw showing relations of Buccal nerve and artery to the medial boundary of the retromolar fossa.

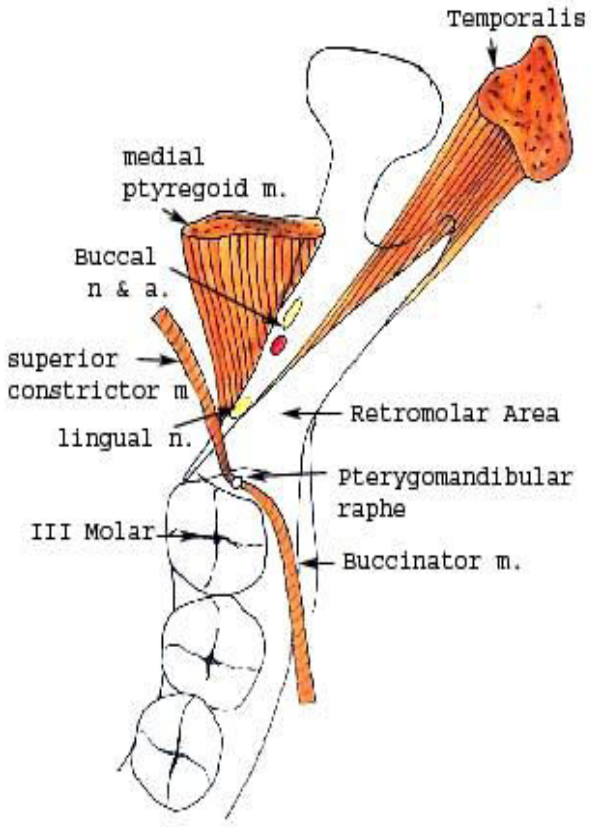

Fig. V: Showing a schematic view of the retromolar area and its relations

von Arx et al, 2011). Considering the importance of this region in operative procedures, the present study, besides documenting the prevalence of retromolar foramen, focused on the study of comprehensive anatomy of retromolar region in dry mandibles and cadavers.

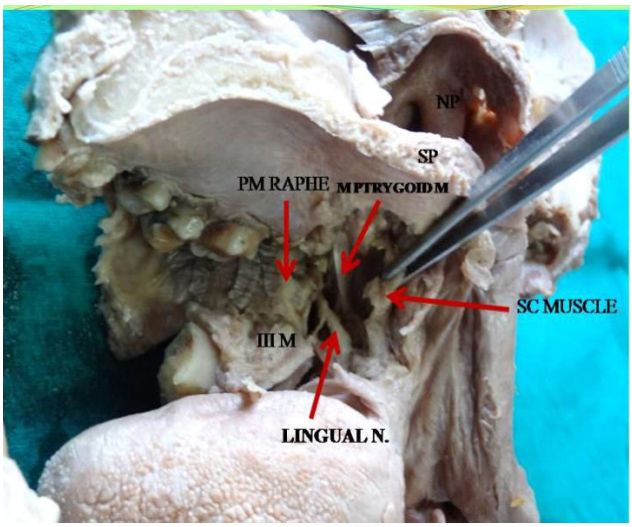

Fig. VI: shows structures seen from medial aspect (oral side) of retromolar region. The pterygomandibular raphe (PM raphe) is seen just posterior to the III molar tooth (III M) giving attachment to the buccinator muscle anteriorly and superior constrictor (SC MUSCLE) posteriorly (cut and held in forceps). The reromolar region is lateral to the area shown . M PTERYGOID M = Medial pterygoid muscle; NP= Nasopharynx; SP= Soft palate.

The prevalence of the foramen ranges from 8-23% as documented by various studies around the world (Table III). The fact that bilateral foramina were observed in association with unerupted third molar teeth is noteworthy and has not been reported earlier. Further studies are needed to substantiate this finding. It also calls for a cautious approach in case of intervention for unerupted third molar.

Altough the cadaveric study did not document the presence of retromolar foramen and its contents in the specimen studied, the findings for the first time very vividly describe the anatomy of this region. It can be deduced from the relations of the region that: i) when present, the retromolar foramen would transmit the misplaced fibres of inferior alveolar nerve, travelling with either lingual or buccal nerves (all three being the branches of mandibular nerve) to their destination or viceversa and ii) it may transmit first branch of inferior alveolar artery and nerve destined to supply the posterior most molars.

Authors believe that the retromolar region being outside the oral cavity , with oral mucosa and superior constrictor muscle intervening, the contents of the retromolar foramen will not be at risk until the superior constrictor is disturbed. However, the canal, as has been documented by von Arx et al (2011) closely abuts the posterior border of third molar and can be at risk in procedures involving the third molar.

Conclusion:

Retromolar foramen was observed in 10 out of 71mandibles studied i.e. 14.08%. In 2 mandibles it was observed bilaterally, and in both these impacted third molar teeth were also observed. Cautious approach is advisable in cases of unerupted third molar teeth owing to close proximity of the foramen in such cases.

References:

1. Ayad T, Guertin L, Soulieres D, Belair M, Temam S, Nguyen-Tan PF: Controversies in the management of retro molar trigone carcinoma. *Head & Neck*, 2009;31(3): 398-405.
2. Berkovitz BKB: Skull and Mandible . In: Grays anatomy (Anatomical basis of clinical practices). S Standring, H Ellis, JC Healy, D Jhonson, A Williams (Eds.); 39th Edn.; Churchill Livingstone; New York; 2005; p. 482.
3. Bilecenoglu B, Tuncer N: Clinical and anatomical study of retromolar foramen and canal. *Journal of Oral and Maxillofacial Surgery*, 2006; 64(10):1493-1497.
4. Goldie SJ, Soutar DS, Shaw-Dunn J: The effect of surgical resection in the region of the retromolar trigone. *Journal of Plastic Reconstructive & Aesthetic Surgery,* 2006; 59(12):1263-1268.
5. Kodera H, Hashimoto I: A case of mandibular retromolar canal: elements of nerves and arteries in this canal; *Kaibogaku Zasshi (Journal of Anatomy)*, 1995;70(1):23-30.
6. McGregor AD, MacDonald DG.; Routes of entry of squamous cell carcinoma to the mandible. *Head & Neck Surgery,*1988;10: 294–301.
7. Narayana K, Nayak UA, Ahmed WN, Bhat JG, Devaiah BA; The retromolar foramen and canal in south Indian dry mandibles. *European Journal of Anatomy*, 2002; 6 (3): 141-146 .
8. Ossenberg NS; Retromolar foramen of the human mandible. *American Journal of Physical Anthropology*, 1987; 73(1): 119-128.
9. Sawyer R, Kiely ML: Retro molar foramen: a mandibular variant important to dentistry. *Annals of Dentistry,* 1991;50(1):16-18.
10. Schejtman R, Devoto FC, Arias NH; The origins and distribution of elements of the human mandibular retro molar canal. *Archives of Oral Biology,* 1967;12(11):1261-1267.
11. Senthil Kumar S, Kesavi D: A Study on the incidence of Retromolar Foramen and Canal in Indian Dried Human Mandibles and its Clinical Significance. *International Journal of Anatomical Sciences*, 2010;1: 14-16.

12. Suazo GL, Zavando MD, Cantin LM: Retromolar Canal and Foramen Prevalence in Dried Mandibles and Clinical Implications. *International Journal of Odontostomatology,* 2008;2 (2) :183-187.
13 von Arx T, Hänni A, Sendi P, Buser D, Bornstein MM: Radiographic study of the mandibular retromolar canal: an anatomic structure with clinical importance. *Journal of Endodontology*, 2011;37(12):1630-1635.

Source of Support : Nil.
Conflict of Interest: None declared.

Research Article

Study of Variations in Pattern of Calcaneal Articular Facets in Human Tali in the Population of Rajasthan (India).

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(Received February, 2013) (Accepted April, 2013)

Abstract:

Talus (astragalus) is the second largest tarsal bone. It has no muscular or tendinous attachment. It takes part in the formation of various articulations in the form of talocrural , talocalcaneonavicular or subtalar joints. The prior knowledge of the anatomical set of talus and its various articulations holds significance in operating procedures. Knowing anatomy of talus not only helps in delineating underlying pathology but also helps in treatment. Three hundred dry adult tali (150-right and 150-left) were studied. Each talus was examined for the presence of various patterns of articular facets. They were classified into five groups. Type I was found in 39% cases. Type II in 43.7% cases, Type III in 6% cases, Type IV in 5.3% cases and Type V was in 6% cases; type V has two subtypes. Subtype 'A' was found in 5% cases & subtype 'B' was found in 1% cases. In the present study, highest incidence of type II tali was 43.7 % and type IV had lowest incidence of 5.3%. These variations and their incidences can be used as an anthropological marker for racial and regional differences in unidentified bones. Further, studies on various other population is indicated using larger sample size to make comparative studies more meaningful.

Key Words: Talus, Calcaneal articular facets, Calcaneum, Subtalar joint.

Introduction:

Talus is the second largest of the tarsals and is situated between the tibia and fibula superiorly and calcaneum inferiorly. One peculiar feature of talus is that it has no muscular attachments and no tendinous attachments (White et al, 2011). Talus is considered as the cornerstone of medial longitudinal arch of the foot (Kulkarni, 2012). It receives the body weight and transmits it to the plantar arch below (Versfeld, 1986). The prior knowledge of anatomy of talus is significant to the anatomists as well as to the orthopaedic surgeons as fracture of talus is quite common. Even those patients with displaced fractures of the neck who avoid necrosis of the body, run a considerable risk of developing osteoarthrosis especially in subtalar joint (Lorentzen et al, 1977). Unstable joints are more likely to suffer trauma, accidents, or other biomechanical stress as a result of uneven weight distribution and excessive incremental motion which results in development of arthritic changes in subtalar joint (Verhagen, 1993). The subtalar joint is a complex articulation in both its structure and function. The orthopaedicians and sports physical therapists must be familiar with these areas to better understand the rationale for examination and treatment procedures. (Rocker, 1995)

The subtalar (or calcaneal) facets on the inferior aspect of the talus are usually three in number and variable in shape. The anterior subtalar (or calcaneal) facet is the most anterior facet on the plantar (inferior) surface of the talus, often somewhat continuous with the articular surface of the talar head. The medial subtalar (or calcaneal) facet is highly variable, sometimes separated from but often merging to a greater or lesser extent with the anterior subtalar facet. The posterior subtalar (or calcaneal) facet is the largest facet on the plantar surface of the talus. White et al (2011) stated that it is concave and obliquely oriented (posteromedial to anterolateral).

Arora et al (1979), Bilodi & Agrawal (2003) and Kaur et al (2011) studied different patterns of articular facets of calcaneum in human tali. These authors divided talar articular facets into different types and stated that differences in incidence of different types of articular facets could be due to differences in gait, built, structure of population or racial differences. Therefore, prior knowledge of articulation and various anatomical variations in articulation holds significance not only in delineating underlying pathologies but also in its treatment. Thus, present study was carried out to determine incidence of various types of calcaneal articulating facets in human tali, variations in both feet and correlate these findings to existing literature.

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Material and Methods:

The Present study was carried out on 300 dry (150 right and 150 left) adult tali of unknown age and sex from bone bank of Department of Anatomy, S.M.S. Medical College, Jaipur, Rajasthan. As far as it could be ascertained, samples were free of physical or pathological damage or any anomalies. Each talus was carefully examined for various patterns of articulating facets for calcaneum on plantar surface of talus. Articular margin of facets was marked with black sketch pen and each talus was numbered and photographed. Incidence of various patterns was observed and compared with available literature.

Results:

Various researchers have classified these facets into different types. In the present study incidence of various types of calcaneal articular facets were classified according to classification given by Arora et al (1979) and Kaur et al (2011).

Type I: single calcaneal facet on plantar surface of head of talus was found in 39% cases (Fig. I).

Fig. I: Showing single calcaneal facet present on plantar surface of head of talus (type I).

Type II: single calcaneal facet on plantar surface of head of talus divided by a ridge into two parts. It was found in 43.7% cases (Fig. II).

Type III: two calcaneal facets on plantar surface of head of talus separated partly by a ridge and partly by a groove and was found in 6% cases (Fig. III).

Type IV: two calcaneal facets on plantar surface of head of talus separated by a non-articular groove, it was found in 5.3% cases (Fig. IV).

Type V: has two subtypes:-

VA- single calcaneal facet continuous with posterior calcaneal facet. It was found in 5% cases. (Fig. Va).

VB- Two calcaneal facets; one of them continuing with

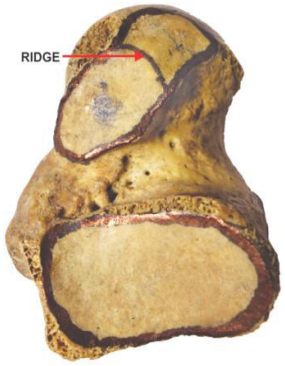

Fig II: Showing Single calcaneal facet on plantar surface of head of talus divided by a ridge into two parts (type II).

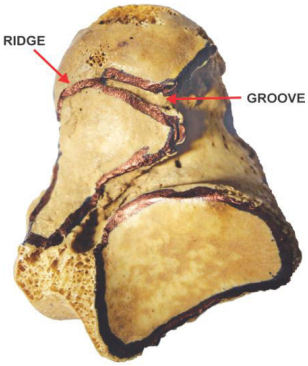

Fig. III: Showing Two calcaneal facets on plantar surface of head of talus separated partly by a ridge and partly by a groove (type III).

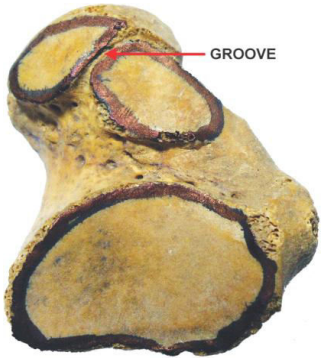

Fig. IV: Showing Two calcaneal facets on plantar surface of head of talus separated by a non-articular groove (type IV).

Fig.V(a): Showing single calcaneal facet continuous with posterior calcaneal facet (type Va).

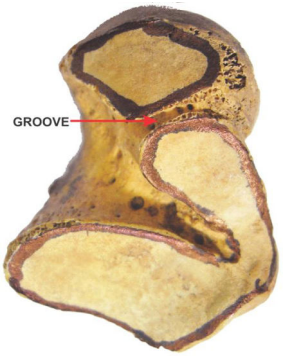

Fig. V(b): Showing two calcaneal facets. One of them is continuous with posterior calcaneal facet (type Vb).

Table I:- Incidences of various types of calcaneal articular facets in human tali in the present study.

	Type I	Type II	Type III	Type IV	Type V Subtypes	
					V(a)	V(b)
Total (300)	117	131	18	16	15	3
(%)	39%	43.7%	6%	5.3%	5%	1%
Right (150)	59	58	12	9	10	2
(%)	39.3%	38.7%	8%	6%	6.7%	1.3%
Left (150)	58	73	6	7	5	1
(%)	38.7%	48.7%	4%	4.7%	3.3%	0.6%

posterior calcaneal facet. It was found in 1% cases. (Fig. Vb).

In the present study type II tali had the highest incidence i.e. 43.7 % and type IV had lowest incidence i.e. 5.3%. Results were compared with earlier studies (Table I).

Discussion:

The present study was carried out to verify the incidence and variations in types of calcaneal facets on tali, their alliance with racial similarities and differences if any. The variations on plantar surface of the talus enable the tali to be classified according to the number and disposition of the articular facets. In the present study, Type II showed the highest incidence of 43.7%. It was more on the left side (48.7%) as compared to the right side (38.7%). This observation was comparable with study of Bilodi (2006) who observed incidence of Type II to be 50%. Lee et al (2012) reported incidence of this type of facet to be 31.6% in Koreans. Though, much higher incidence of 78% was reported by Arora et al (1979) and much lower by Kaur et al (2011) & Barbaix et al (2000) to be 24% & 22% respectively. The incidence of Type I tali was 39% in the present series which is in agreement with the observations of Kaur et al (2011) as 45% and Lee et al (2012) as 30.3%. The incidence of type I tali was almost equal on the right side (39.3%) and on the left side (38.7%). Other researchers have reported a lower incidence of this type of tali (Table II). Incidence of Type III tali was found to be 6% in the present study which is at par to the work of Barbaix et al (2000). The least common type of talus found in the present study was of type IV (5.3%). Kaur et al (2011), Bilodi (2006) & Arora et al (1979) also reported incidence of this type of tali to be least common in their studies. In contrast, Barbaix et al (2000) & Lee et al (2012) found it to be very high i.e. 39% & 28.9% respectively. Bilodi & Agarwal (2003) did not observe this type of tali in their study. In the present study incidence of Type V tali was 6%, where as Arora et al (1979) found it to be 2%. In contrast much higher incidence was reported by Bilodi & Agarwal (2003) as 56%, Bilodi (2006) as 18.44% and Kaur et al (2011) as 17% (Table II).

Barbaix et al (2000) and Lee et al (2012) did not find type V in their studies. In addition, Barbaix et al (2000) found missing anterior facet configuration in 11% of tali. Results of the present study showed wide range of variations in incidence of various patterns of articular facets of tali as compared to earlier workers. Kaur et al (2011) concluded that these variations may be due to different type of population, type of gait and built of an individual or the place of living which could be plain or hilly area. Some of these variants probably have an impact on the position of the axis of movements between talus and calcaneum resulting in different positions relative to load and ground reaction forces, and hence, in more or less inversion momentum. Bruckner (1987) opined that a significant difference in joint mobility is expected between joints with different numbers of articular facets. In the three-facet arrangement, the talus sits on an architecturally stable articular tripod and contacts the calcaneum at three distinct points. Both, joint motion and facet surface areas are restricted. A two facet configuration would be more mobile. The two anterior facets combine to form one larger facet and enable more gliding of joint surfaces. The one facet configuration should be the most mobile since all the facets have blended into one. Verhagen (1993) supported Bruckner's hypothesis and found that arthritic limping was significantly less common in 3 separate facets configuration than in others and stated that people with long continuous facet or only medial facet may be at a greater risk for subtalar joint instability than individuals with the 3 facet configuration.

Barbaix et al (2000) concluded that these variations might well be an overlooked intrinsic risk

Table II: Comparison of incidences of various types of calcanean articular facets in human tali.

Workers	Arora et al.(1979)	Barbaix et al. (2000)	Bilodi & Agarwal (2003)	Bilodi (2006)	Kaur et al. (2011)	Lee et al. (2012)	Present study
Population	Indians	Belgium	Nepal	South Indians	North Indians	Koreans	Rajasthan-India
n	500	122	50	240	100	76	300
Type I	16%	21%	10%	10%	45%	30.3%	39%
Type II	78%	22%	14%	50%	24%	31.6%	43.7%
Type III	1%	6%	20%	16.6%	9%	28.9%	6%
Type IV	3%	39%	----	5%	5%	9.2%	5.3%
Type V	2%	----	56%	18.4%	17%	----	6%
Subtype V(a)	----		----	----	8%	----	5%
Subtype V(b)	----		----	----	9%	----	1%

n=total tali examined.

factors for a chronic post traumatic lateral instability of the ankle and of the subtalar joint in particular. These variations exist from the earliest days of life without causing any trouble. So, at the start of complaints like pain or instability, a detailed analysis is needed to explain why the pre existing variants have been traumatized. In many diseases of the foot, such as talocalcaneal arthritis and coalition, intra-articular fractures and congenital dysmorphological flat foot, valgus deformities, the size and shape of the bones, the relationship of talus and calcaneum with each other and other bones of the foot must be considered for treatment procedures like internal and external fixation, osteotomy or anatomic reduction.

In the 'triple arthrodesis' procedure to correct the deformities of flat foot, the articular facet configuration should be clearly kept in mind in order to safely denude the surfaces of the subtalar joints of all the articular cartilages (Richardson, 1998).

A classification system is a first requirement to distinguish different configuration types. In the present study, classification given by Arora et al (1979) and Kaur et al (2011) was used to classify different fusion types. This classification was not used by all the other authors, which could give a biased distribution of the different configurations especially for fused types. This can create difficulties to compare the results. It is important to use a standard classification in future studies. Nevertheless, when new configurations are found, such as observed by Barbaix et al (2000), the classification must easily be adaptable.

The present study shows racial similarities as well as differences. A reliable estimation of race from skeleton using various criteria is important while dealing with undocumented skeletal material. These variations and their incidences can be used as an anthropological marker for racial and regional differentiation of unidentified bones.

Today with the aid of improvement of the technology there has been a great development of ankle prosthesis, implants, etc for the foot. Detailed anatomic information will act as a baseline for advanced treatment procedure.

Talar articular surface characteristics and sex difference was not taken in account during the present study. Future studies taking care of these factors on other population groups using larger sample size and by using imaging modalities is being suggested to make comparative studies more meaningful.

References:

1. Arora AK, Gupta SC, Gupta CD, Jeyasing P: Variations in calcaneal articular facets in Indian tali. *Anatomiseher Anzeiger*, 1979; 146: 377-380.
2. Barbaix E, Roy PV, Clarys JP: Variations of anatomical elements contributing to subtalar joint stability: intrinsic risk factors for post traumatic lateral instability of the ankle? *Ergonomics*; 2000; 43(10): 1718-1725.
3. Bilodi AK, Agrawal BK: Study of fifty human tali for calcaneal articular facets.*Medical Journal of Kathmandu University*, 2003;2(3): 213-215.
4. Bilodi AK: Study of calcaneal Articular facets in human tali; *Medical Journal of Kathmandu University*, 2006; 4(1): 75-77.
5. Bruckner JS: Variations in the Human Subtalar Joint; *Journal of Orthopaedic & Sports Physical Therapy*; 1987; 8(10):489-494.
6. Gupta SC, Gupta CD, Arora AK: Pattern of talar articular facets in Indian calcanei. *Journal of Anatomy*, 1977;124(Part 3):651-655.

7. Kaur M, Kalsey G, Laxmi V: Morphological classification of tali on the basis of calcanean articular facets. *PB Journal of Orthopedics*; 2011; 12(1):57-60.
8. Kulkarni NV: In: Clinical Anatomy (A problem solving approach; 2nd Edn.; Jaypee brothers medical publishers (P)Ltd; New Delhi, 2012; pp: 830.
9. Lee JY, Jung MH, Lee JS, Choi BY, Cho BP: Types of calcaneal articular facets of the talus in Korean. *Korean Journal of Physiology Anthropology*, 2012;25 (4): 185-192.
10. Lorentzen JE, Christensen SB, Krogsoe O, Sneppen O: Fractures of the neck of talus. *Acta Orthopaedica Scandinavica*, 1977; 48(1):115-120.
11. Richardson GE: Pes Planus . In: Campbell's Operative Orthopaedics, Vol. II. S Terry Canale, Kay Daugherty, Linda Joses (Eds.); 9th Edn.; Mosby St. Louis, 1998; pp. 1720-1725.
12. Rockar PA (Jr): The Subtalar Joint: Anatomy and Joint Motion. *Journal of Orthopaedic & Sports Physical Therapy*; 1995; 21 (6):361-372.
13. Verhagen FD: Arthritis of the subtalar joint associated with sustentaculum tali facet configuration. *Journal of Anatomy,* 1993; 183; 631-634.
14. Versfeld GA: The ankle-foot complex. In: Lee McGregor's Synopsis of Surgical Anatomy. GAG Decker, DJ du Plessis (Eds.); 12th Indian Edn.; Verghese Publishing House, Bombay. 1986; pp: 539.
15. White TD, Black MT, Folkens PA: In: Human Osteology; 3rd Edn.; Elsevier. Academic press U.K; 2011; pp.: 276-277.

Source of Support : Nil.
Conflict of Interest: None declared.

Research Article

A comparative Study of Tracheal Intubation through i-gel® and Intubating Laryngeal Mask Airway (ILMA®)

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(Received September, 2012) (Accepted June, 2013)

Abstract:

In this prospective randomized study, success rate of blind tracheal intubation through two different supraglottic airway devices viz. i-gel ® and the intubating laryngeal mask airway (ILMA)® was compared a using conventional polyvinylchloride endotracheal tubes.

Eighty patients undergoing elective surgery under general anaesthesia were randomized in two groups comprising of 40 patients each to tracheal intubation using either i-gel or ILMA. After induction of anesthesia, supraglottic airway device(SAD) was inserted and on achieving adequate ventilation with the device, the fibrescopic view of the larynx was obtained through the SAD for laryngeal grading. Then fiberscope was removed and blind tracheal intubation was attempted through the SAD. Success at first attempt and overall tracheal intubation success rates were evaluated and tracheal intubation time was measured.There was no difference in the incidence of adequate ventilation with either of the SAD. The glottic view (Laryngeal grading) was better in i-gel group. The grade 1 laryngeal grading was obtained in 82.5% cases in i-gel group as compared to 75% cases in ILMA group. The success rate in first attempt was 65% in i-gel group and 52.55% in ILMA group, while overall success rate was 77.5% in i-gel group as compared to 62.5% in ILMA group. Time taken for successful tracheal intubation through i-gel was lesser (20.4 sec.) as compared to ILMA (30.68 sec.) and the difference was statistically significant ($p < 0.001$). Both the SADs were proved to be useful alternative to conventional laryngoscope for tracheal intubation. In the present study, i-gel had better success rate in tracheal intubation as compared to ILMA.

Key Words: Supraglottic airway device, ILMA , Tracheal intubation, i-gel, Laryngoscopy.

Introduction:

Tracheal intubation with Macintosh laryngoscope is considered as the "gold standard" in airway management (Macintosh, 1943). However, in some situations it is difficult and demands experience to perform intubation. Supraglottic airway devices (SADs) are helpful in difficult airways and in emergency life threatening situations. Some SADs like intubating laryngeal mask airway (ILMA) and i-gel® allow for subsequent tracheal intubation using blind or a fibreoptic guided technique for management of airway. The use of supraglottic devices as a means of rescue in patients who are difficult to intubate or ventilate has increased in the field of anaesthesiology and in emergency medicine. The present study is designed to evaluate the success rate of blind intubation using two different supraglottic devices, the i-gel and the ILMA.

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Material and Methods:

This study was conducted on 80 patients undergoing elective surgery under general anaesthesia, after approval of Institutional ethics committee. Written informed consent was obtained from all patients. All the cases were performed by the same team of Anaesthesiologists who were experienced in use of both the type of SADs. Inclusion criteria were ASA physical status I and II and age between 16 to 60 years for both the sexes. Patients with head injury, psychiatric disorder, respiratory tract pathology of oropharynx and larynx, endocrine disorder, predicted difficult airway (such as mouth opening < 2 cm, modified Mallampati scale class 3 and 4, BMI>35kg/m^2), patient having gastro-esophageal reflux disease, hiatus hernia and pregnancy, were excluded from the study. Patients were randomly allocated by a computer generated random table to one of the two groups comprising of 40 patients each to either i-gel group or ILMA group.

Anaesthetic Technique:

After premedication with ranitidine 50 mg and

metoclopramide 10 mg intravenously 30 minutes before induction, patient was shifted to the operation theatre. In the operation theatre, after establishing an intravenous route, ringer lactate solution was started. All patients received intravenous glycopyrrolate 0.2mg, tramadol 2mg/kg and midazolam 0.03mg/kg, 10 minutes before induction of anaesthesia. Standard monitors were attached. All the patients were pre-oxygenated with 100% oxygen for 3 minutes. Induction was done with propofol 2 to 2.5 mg/kg; muscle relaxation was facilitated with vecuronium 0.1mg/kg and mask ventilation was continued for 3 minutes with mixture of oxygen, nitrous oxide and halothane.

Then depending on body weight the following sizes of the SADs (i-gel/ILMA) and endotracheal tube (ETT) were choosen with little change in manufacturer's recommedations:

Size of SAD	Patients body weight(kg)	ETT size internal diameter in mm
i-gel		
Size 3	30-50	7.0
Size 4	50-90	7.5
ILMA		
Size 3	30 -50	7.0
Size 4	50-70	7.5
Size 5	>70	7.5

Conventional PVC (Polyvenylchloride) endotracheal tube (Portex ®) was used for blind tracheal intubation. Both SADs and ETT were lubricated with 2% lignocaine jelly prior to use. The i-gel supraglottic airway device was inserted in extended neck position, while the ILMA was inserted in neutral neck position. Duration of successful SAD insertion was defined as the time elapsed from the insertion of SAD between the dental arches untill the confirmation of successful ventilation determined by chest wall movement, auscultation of breath sounds, capnography and absence of oropharyngeal leak with peak airway pressure of > 20 cm of H_2O. The time was measured with the help of a stopwatch. If successful ventilation was not established, accepted maneuvers were used as recommended by manufacturer (Brain et al, 1997; Gatward et al, 2008) for ILMA and i-gel .The number of attempts required for SAD insertion were recorded. A failed attempt was defined as removal of the device from the mouth before reinsertion.If the device was not successfully inserted in second attempt this was recorded as failure of SAD insertion.

After achieving successful ventilation with SAD, the positioning of the device in relation to the larynx was visualized using a fiberscope and graded as: 1- Vocal cords entirely visible, 2- Vocal cords or arytenoid cartilage partially visible, 3- Epiglottis only visible and 4- No laryngeal structures visible.

Following this, the fiberscope was removed and blind tracheal intubation was attempted through SAD. When resistance was felt during ETT insertion, following maneuvers were tried in i-gel group :

1 Twisting of the tracheal tube to align the bevel , up and down movement of the tracheal tube gently within the SAD.

2. Cricoid pressure.

If resistance was encountered during insertion of tracheal tube in ILMA group, a standardized algorithm was followed on the basis of the distance at which the resistance was felt, as recommended by manufacturer (Brain et al, 1997; Kihara et al, 2002). If no resistance was felt during insertion of tracheal tube it was advanced fully into the SAD. Duration of successful blind tracheal intubation through SAD was defined as the time elapsed from passing the ETT through SAD untill the confirmation of successful ventilation, which was determined by chest rise, auscultation of breath sounds and capnography. In both the groups, SAD was removed using one size smaller tracheal tube. In both the study groups, maximum two attempts at device insertion and maximum two attempts at tracheal intubation were allowed. If tracheal intubation through the device was unsuccessful, it was performed by direct laryngoscopy. Ease of SAD insertion was graded on a subjective score of 1to 3; 1- Easy, 2- Satisfactory and 3- Difficult.

In addition, any lip trauma, dental injury and blood mixed secretions over SAD and ETT at the time of its removal was observed. In both the groups, post-operative analgesia was standardized. Injection diclofenac 1 mg / kg was started 8 hourly in post-operative ward as per routine analgesic protocol being followed in this institution by surgeons starting from the time when patient arrived in post-surgical ward from the operation theatre. In post-operative period, at two hours, an investigator who was blinded to the study, asked the patients about throat pain, dysphonia, dysphagia and for any change in voice (hoarseness).

Throat pain (at rest) was assessed on a score of 0 to 3; 0- no pain, 1- mild pain/ discomfort only; 2- moderate pain and 3- severe pain. Dysphonia,

Table I: Demographic data of patient in two groups:

Patient Characteristics	i-gel®	I LMA®	*Chi*-square	*t*-test	*p*-value
Sex-male/female	11/29	12/28	0.061	-	_
ASA physical status I/II	12/28	15/25	0.503	-	_
Mallampati class 1/2	16/24	17/23	0.052	-	_
Age(years) mean ± S D	38.625± 12.192	36.6 ±12.209	-	0.742	0.460
Edentulous status (yes/no)	No	No	-	-	_
Weight(Kg) mean ± S D	53.63 (± 5.485)	51.38 (± 7.008)	-	0.693	0.490
Height(cm) mean ±SD	156.15 (± 6.632)	155.90 (± 7.175)	-	0.641	0.885
Body mass index(Kg/m^2) mean ± SD	21.98 ± 1.552	21.12 ± 1.760	-	0.957	0.342
Mouth opening(cm) mean ± SD	4.3±0.21	4.44±0.18	-	1.64	0.189
Thyromental distance(cm) mean ±SD	7.637±0.240	7.71±0.263	-	0.432	0.160
Neck Circumference(cm) mean ±SD	34.17± 2.52	34.20± 2.53387	-	0.582	0.965

Table II: Success rates and times for Device insertion and Tracheal intubation

Success rate	i-gel® (n=40)	I LMA®(n =40)	*Chi*-square	*t*-test	*p*-value
(I) Supraglottic device insertion first attempt Success rate	95 %	90 %	0.721	-	0.338
Overall Success rate	100 %	100 %	-	-	-
Insertion time When 1st attempt successful (seconds) mean±SD	20.52 (± 1.44)	30.69 (± 1.73)	-	-13.365	<0.0001
Overall insertion time(seconds) mean ±SD	20.92 (± 2.25)	31.75 (± 3.62)	-	-16.043	<0.0001
(II)Tracheal intubation First attempt Success rate	65 %	52.5	0.833	-	0.247
Overall Success rate	77.5 %	62.5 %	2.143	-	0.111
Intubation time When 1st attempt successful, (seconds)mean±SD	18.7308 (± 1.41)	29.63 (± 1.39)	-	-27.414	<0.0001
Overall Intubation time (Seconds) mean±SD	20.41 (± 3.79)	30.68 (± 3.197)	-	-10.780	<0.0001

dysphagia and hoarseness were graded as absent or present.

Data were analysed using IBM SPSS Statistics 20.0 software.The qualitative data between two groups were compared using *Chi Square test* and for comparison of the continuous variable, independent *t-test* was used. Comparison of success rate was done with percentage. $p<0.05$ was considered statistically significant at 95% confidence interval.

Results :

Eighty patients were evaluated in the present study. Equal number of patients were allocated randomly to either i-gel group or ILMA group. Demographic data were similar in both the groups (Table I).

There was no difference in the successful insertion of SADs between the two groups i.e. i-gel and ILMA. With first attempt of SAD insertion, the successful ventilation rate was 95% in i-gel group and 90% in ILMA group. With second attempt of SAD insertion, the successful ventilation rate was 100% in both the groups (Table II). With first attempt, blind tracheal intubation was successful in 65% cases (27 patients) of i-gel group and in 52.5 % cases (21 patients) of ILMA group. With second attempt, blind tracheal intubation was successful in 77.5% cases (31 patients) of i-gel group and in 62.5% cases (25 patients) of ILMA group (Table II). Total time to achieve successful ventilation with SAD alone and time to successful blind tracheal intubation through SAD both were shorter in i-gel group. Time for successful ventilation with SAD was 20.92 seconds in i-gel group and 31.75 seconds in ILMA group ($p<0.001$) .Time to achieve successful intubation through the SADs was 20.41 seconds in i-gel group as compared to 30.68 seconds in ILMA group, $p <0.001$ (Table II).

Table III: Showing fibroscopic laryngeal grading.

Grade	i-gel® (n=40)		I LMA® (n=40)	
	No. of Patients	%	No. of Patients	%
1	33	82.5	30	75
2	07	17.5	10	25
3	0	0	0	0
4	0	0	0	0

Laryngeal view according to fibreoptic endoscope was better in i-gel group (Table III). In i-gel group laryngeal grade 1 was visualized in 82.5% cases (33 patient) in comparison to 75% cases (30 patient) in ILMA group. Laryngeal Grade 2 was visualized in 17.5% cases (7 patient) in i-gel group versus 25.0% cases (10 patients) in ILMA group.

Post-operative complications in both the groups were comparable.

Ease of insertion of supraglottic airway device ®was better in i-gel group than ILMA group (Table V).

Discussion:

The Present study demonstrates 100% success rate for i-gel and ILMA as ventilatory devices. Similar results were reported by Halwagi et al (2012) and Sastre et al (2012) in their study. In the present study, first attempt success rate for blind tracheal intubation was comparable in both the groups and overall success rate in second attempt was higher in i-gel group as compared to ILMA group, unlike the results of Halwagi et al (2012) and Sastre et al (2012) who noticed higher success rate of blind tracheal intubation with ILMA.

Table IV: Showing Post-operative complications.

Grading	i-gel®(n=40)		I LMA® (n=40)s	
	No. of Patients	%	No. of Patients	%
THROAT PAIN:				
0	06	15	04	10
1	30	75	30	75
2	04	10	06	15
3	0	0	0	0
DYSPHONIA:				
Absent	40	100	40	100
Present	0	0	0	0
DYSPHAGIA:				
Absent	39	97.5	39	97.5
Present	01	2.5	01	2.5
HOARSENESS:				
Absent	40	100	40	100
Present	0	0	0	0

Table V: Showing score of ease of insertion of SAD.

Ease of SAD insertion score	i-gel® (n=40)		ILMA® (n=40)	
	No of Patients	%	No of Patients	%
1	32	80	20	50
2	8	20	20	50
3	0	0	0	0

In the present study a higher success rate was achieved in blind tracheal intubation with i-gel, which could be due to : Use of i-gel for last 5 years in the present institution regularly and that the present author experienced that size 4 i-gel was adequate for >50 kg patient for proper seal.

On getting resistance while advancing tracheal tube through SAD, cricoid pressure was used, which made blind tracheal intubation highly successful in i-gel group. In i-gel group intubation was successfully done in 77.5% cases, out of which 39% cases were intubated easily without any maneuvers and in rest of the cases (61%) cricoid pressure was used; this observation was not statistically significant, which could be due to a small sample size. In the present study, time needed for successful lung ventilation and blind tracheal intubation was shorter in i-gel group than ILMA group, (Table II) which was statistically significant ($p<0.05$); this osbservation is at par with the results of Halwagi et al (2012). As far as ease of insertion of SAD was concerned in the present study, it was easier in i-gel group; similar results were obtained by Kleine-Brueggeney et al (2011). This may be due to i-gel being more flexible, soft, non-metallic and with more anatomical curvature as compared to

ILMA. Laryngeal grading according to fibreoptic view was also better in i-gel group (Table III). The difference in laryngeal grading in both the groups could be due to presence of the epiglottic bar in the ILMA which may cause poorer fibrescopic view and intubation through the device Sastre et al (2012); Michalek et al (2010); McNeillis et al (2001); Wharton et al (2008). The i-gel airway has its epiglottic blocker on the outer surface of the bowl, and the fibrescopic view of larynx is usually straight and unobstructed. In i-gel group, in the cases in which blind tracheal intubation failed (9 patients) even after maneuvers, needed stylet for intubation with Macintosh laryngoscope. The laryngeal grading in most of these patients (7 patients) were grade II. In the present study, conventional ETT (Portex ® PVC) was used even in ILMA group, as there was no difference in successful blind tracheal intubation with conventional tracheal tube and silicon wire-reinforced tracheal tube in studies conducted by Lu et al (2000) & Kundra et al (2005). The incidence of post-operative complications were comparable in both the groups. While the incidence of sore throat was lesser in i-gel group as compared to ILMA group; this observation is similar to that of Keijzer et al (2009). In the present study, dysphonia and hoarseness was absent in both the groups. There was no incidence of lip trauma, dental trauma and blood tinged secretions over the SAD or ETT in any of the case in both the groups. The use of i-gel as a conduit for tracheal intubation has been documented in several case reports. These cases described anticipated or unanticipated difficult airway situations, and they all involved the use of fibreoptic bronchoscope (Sharma et al, 2007; Michalek et al, 2008; Bamgbade et al, 2008; Campbell et al, 2009; Emmerich & Dummler, 2008). Michalek et al (2008) evaluated blind tracheal intubation through the i-gel in 3 different airway manikins, obtaining success rate of 51%. Theiler et al (2011) studied "visualized blind intubation" through the i-gel and the LMA Fastrach in patient presenting with at least one criterion for difficult intubation. Their results demonstrated a substantially poor success rate (15%) with i-gel as compared with the LMA Fastrach (69%). The success rate of tracheal intubation on the first attempt with the LMA Fastrach, as reported in earlier randomized controlled trials, varies between 48% to 87% (Lu et al, 2000; Joo & Rose, 1999; Liu et al; 2008). Kleine-Brueggeney et al (2011) observed that fibreoptic guided intubation in first attempt with i-gel was 96% as compared to 90% in single use intubating laryngeal mask airway (sILMA) in a randomized trial in patients with predicted difficult airway (Lu et al, 2000). Results of the present study have shown comparable success rate for tracheal intubation with PVC ETTs through both the types of SADs.

Conclusion:

Both the supraglotic airway devices (SADs) i-gel and ILMA were proved to be useful alternative to conventional laryngoscope for tracheal intubation though i-gel had better success rate in tracheal intubation as compared to ILMA.

References:

1. Bamgbade OA, Macnab WR, Khalaf WM: Evaluation of the I-gel airway in 300 patients. *European Journal of Anaesthesiology*, 2008; 25(10):865-866.
2. Brain AIJ, Verghese C, Addy EV, Kapila A, Brimacombe J: The intubating laryngeal mask: II. A preliminary clinical report of a new means of intubating the trachea. *British Journal of Anesthesia*, 1997;79(6):704-709.
3. Campbell J, Michalek P, Deighan M: I-gel supraglottic airway for rescue airway management and as a conduit for intubation in a patient with acute respiratory failure. *Resuscitation*, 2009;80(8):963.
4. Emmerich M, Dummler R: Einsatz der i-gel-Larynxmaske bei schwierigem Atemweg. *Der Anaesthesist,* 2008;57(8):779-781.
5. Gatward JJ, Cook TM, Seller C, Handel J, Simpson T, Vanek V, Kelly F: Evaluation of the size 4 i-gel airway in one hundred non-paralysed patients. *Anaesthesia*, 2008;63(10):1124-1130.
6. Halwagi AE, Massicotte N, Lallo A, Gauthier A, Bourdreault D, Ruel M, Girard F: Tracheal intubation through the I-gel supraglottic airway Versus the LMA Fastrach. A randomized controlled rial. *Anesthesia & Analgesia*, 2012;114(l):152-156.
7. Joo HS, Rose DK: The intubating laryngeal mask airway with and without fiberoptic guidance. *Anesthesia & Analgesia*, 1999;88(3):662-666.
8. Keijzer C, Buitelaar DR, Efthymiou KM, Sramek M, Cate JT, Ronday M, Stoppa T, Huitink JM, Sehutte PF: A Comparison of Postoperative Throat and Neck Complaints After the Use of the I-gel® and the La Premiere® Disposable Laryngeal Mask : A Double-Blinded, Randomized, Controlled Trial. *Anesthesia & Analgesia*, 2009;109(4):1092-1095.
9. Kihara S, Yaguchi Y, Brimacombe J,Watanabe S, Taguchi N, Hosoya N: Intubating laryngeal mask airway size selection .A randomized triple crossover study in

paralysed, anaesthetized male and female adult patients. *Anesthesia & Analgesia*, 2002;94(4):1023-1027.
10. Kleine-Brueggeney M, Theiler M, Urwyler N, Vogt A, Greif R: Randomized trial comparing the I-gel and Magill tracheal tube with the single- use ILMA and ILMA tracheal tube for fibreoptic-guided intubation in anaesthetized patients with predicted difficult airway. *British Journal of Anesthesia*, 2011;107(2):251-257.
11. Kundra P, Sujata N, Ravishankar M: Conventional tracheal tubes for intubation through the intubating laryngeal mask airway. *Anesthesia & Analgesia*, 2005; 100(1):284-288.
12. Liu EH, GoyRW, LimY, Chen FG: Success of tracheal intubation with intubating laryngeal mask airways:a randomized trial of the LMA Fastrach and LMA CTrach. *Anesthesiology*, 2008:108(4):621-626.
13. Lu PP, Yang CH, Ho AC, Shyr MH: The intubating LMA : a comparison of insertion techniques with conventional tracheal tubes. *Canadian Journal of Anaesthesia,* 2000;47(9):849-853.
14. Macintosh RR: A new laryngoscope. *Lancet* 1943;241(6233);1:205.
15. McNeillis NJ, Timberlake C, Avidan MS, Sarang K, Choyce A, Radcliffe JJ. Fibreoptic views through the laryngeal mask and intubating laryngeal mask. *European Journal of Anaesthesiology*, 2001;18(7):471-475.
16. Michalek P, Donaldson W, Graham C, Hinds JD: A comparison of the I-gel supraglottic airway as a conduit for tracheal intubation with the intubating laryngeal mask airway : a manikin study. *Resuscitation*, 2010;81(1):74-77.
17. Michalek P, Hodgkinson P, Donaldson W: Fiberoptic intubation through an I-gel supraglottic airway in two patients with predicted difficult airway and intellectual disability. *Anesthesia & Analgesia*, 2008;106(5):1501-1504.
18. Sastre JA, Lopez T, Garzon JC: Blind tracheal intubation through two supraglottic devices:i-gel versus Fastrach intubating laryngeal mask airway (ILMA). *Revista Espanola de Anesthesiologia Reanimacion*, 2012;59(2):71-76.
19. Sharma S, Scott S, Rogers R, Popat M: The I-gel™ airway for ventilation and rescue intubation. *Anaesthesia*, 2007;62(4):419-420.
20. Theiler L, Kleine-Brueggeney M, Urwyler N, Graf T, Luyet C, Greif R: Randomized clinical trial of the i-gel and Magill tracheal tube or single-use ILMA and ILMA tracheal tube for blind intubation in anaesthetized patients with a predicted difficult airway. *British Journal of Anesthesia*, 2011;107(2):243-250.
21. Wharton NM, Gibbison B, Gabbott DA, Haslam GM, Muchatuta N, Cook TM. I-gel insertion by novices in manikins and patients. *Anaesthesia*, 2008;63(9):991-995.

Source of Support : Nil.
Conflict of Interest: None declared.

Research Article

Endodontic Trends :Where We Are And Where We Should Be-A Survey Report

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(Received October, 2012) (Accepted June, 2013)

Abstract:

A survey was conducted to gather information on methods, materials and attitudes employed in root canal treatment by Dentists and in order to evaluate and improve the quality of current practice. Questionnaire comprising of 35 questions on Endodontic practice and root canal treatment i.e. case selection for treatment, planning, equipment & materials used was mailed to 230 randomly selected General Dental Practitioners.

Reply rate was 67%. Result demonstrated that few dentists used rubber dam. Variety of instruments were used for root canal preparation; stainless-steel hand files being the most popular (56%) and technique of choice was step back (59.66%). Sodium hypochlorite irrigation and calcium hydroxide dressing was used by 52% and 23% respectively. Most practitioners (91%) obturated root canals with lateral compaction of gutta-percha. Only 14% of respondents used apex locators for determining the working length, whilst 19% did not take any pre-operative radiograph.

Practicing dentists do not comply with international quality standards and do not use recently introduced techniques.

Key Words: Questionnaire survey, general dental practitioner, root canal treatment.

Introduction:

Endodontics is one of the fastest-growing disciplines in daily clinical practice (Chan et al, 2006). Root canal treatment is considered an essential element in the dental services provided to the population (Al-Omari, 2004). Nowadays, general dental practitioners (GDPs) are faced with a multitude of materials and techniques for such procedures, whilst dental schools consciously attempt to tailor their curricula towards evidence-based interventions (Chan et al, 2006). Several studies have revealed that the majority of dentists do not comply with the formulated guidelines for quality of root canal treatment. The majority of endodontic treatment is provided by the GDPs due to absence of specialists in endodontics and due to the lack of postgraduate programs (Al-Omari, 2004).

The purpose of the present study was, therefore, to investigate the attitude of dentists toward endodontic treatment and to explore the materials and methods employed by GDPs of Northern India and to compare these findings with well acknowledged international academic standards (Al-Omari, 2004).

Material and Methods:

A questionaire survey dealing with materials and techniques used in endodontic treatment was conducted among GDPs of North India. A two-part questionaire was mailed to 230 randomly selected GDPs mainly of Northern India. The first part requested basic information regarding age, year of qualification, field of practice, etc. The second part consisted of 35 questions on Endodontic practice and root canal treatment. Since the study was designed to explore the endodontic practice profile among GDPs, dental specialists and dentists with limited practice in any discipline were excluded.

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Survey of endodontic practice by the general practitioners

1. Year of qualification:_____

2. Are you a post-graduate?
   □ Yes □ No
3. Type of practice:
   □ Private □ Government/hospital
   □ Others (please specify)
4. Do you regularly treat (tick all those which apply):
   □ single-rooted endodontic cases
   □ multi-rooted endodontic cases
   □ re-treatment cases
5. On the average, how many root canal therapy do you perform per week?
   □ 0-5 teeth □ 6-10 teeth □11-15 teeth
   □ 16-20 teeth □ 21 teeth or above

6. Are you satisfied with your current endodontic technique?
   □ yes □ no
   If No, in what aspects (please specify):
7. Do you feel that your dental school's training in endodontic therapy was adequate?
   □ yes □ no

QUESTIONAIRE

1. Do you take Pre-operative Radiograph ?
   □ Always □ Often
   □ Occasionally □ Never
2. Do you get the Consent form signed prior to the treatment?
   □ yes □ no
3. Which technique of radiography you use?
   □ Conventional □ Real-times images
4. Do you check vitality of involved tooth ?
   □ Always □ Often
   □ Occasionally □ Never
5. How do you sterilize your endodontic files?
   □ Autoclave □ Cold sterilization
   □ Glass bead □ Discard after each patient
6. Do you apply topical anaesthesia before injecting local anaesthesia ?
   □ Always □ Often
   □ Occasionally □ Never
7. What gauge of needle do you use for injecting local Anaesthesia?
   □ 18 mm □ 23mm □ 25mm □ 27mm
8. Do you use Rubber dam isolation?
   □ Always □ Often
   □ Occasionally □ Never
9. Usual no. of visits to complete endodontic therapy?
   □ Single □ Multiple
10. For Acute Pulpitis/Alveolar abscess (emergency appointment) choice of treatment?
    □ Root canal opening with Analgesics & Antibiotics.
    □ Only analgesics & antibiotics followed by root canal opening once acute symptoms subside.
11. Do you use Endodontic Explorer for locating the canals?
    □ Always □ Often
    □ Occasionally □ Never
12. What kind of instruments you use for Endodontics?
    □ Stainless steel □ NiTi
13. Which method of instruments you use?
    □ Hand instruments □ Rotary instruments
14. Do you use Golden mediums?
    □ yes □ no
15. Which is the 1st Endodontic instrument you put in the canal?
    □ Broach □ k file
    □ H file □ Reamer
16. Do you use Apex Locator?
    □ Always □ Often
    □ Occasionally □ Never
17. What working distance you use from the Radiographic apex?
    □ 1-2 mm □ 2-3mm
    □ 0.5mm □ as far as apex
18. Do you use Open Dressing ?
    □ Always □ Often
    □ Occasionally □ Never
19. Which method you use for cleaning and shaping?
    □ Step back □ Crown-down
    □ Conventional □ Hybrid
20. Do you use Magnifying lens or Operating Microscope?
    □ Always □ often
    □ occasionally □ never
21. Which irrigant you use for root canal irrigation?
    □ Sodium hypochlorite □ Chlorhexidiene
    □ Distilled water □ Hydrogen peroxide
    □ Saline □ EDTA
22. What concentration of Sodium hypochlorite you use for irrigation?
    □ 2% □ 5% □ diluted
23. How many times you use Endodontic files?
    □ single use □ many times
24. Do you use Gates-Glidden drill ?
    □ Always □ Often
    □ Occasionally □ Never
25. Which intra-appointment medicament you use between visits?
    □ Formocresol □ CMCP □ No medicament
26. Do you Infra-occlude the RCT treated tooth?
    □ yes □ no
27. Do you take master cone radiograph?
    □ Always □ often
    □ occasionally □ never
28. How many total radiograph you take for each case?
    □ 2 □ 3 □ 4 □ none
29. Which temporary restorative material you use?
    □ Cavit □ GIC □ Zinc-oxide
    □ Eugenol □ IRM{21}

30. Which root canal sealer do you use?
    - □ Calcium hydroxide (Base)
    - □ Zinc oxide (base)
    - □ Resin-based □ Any other
31. Which technique of Obturation do you perform?
    - □ Lateral condensation
    - □ Vertical condensation □ any other
32. Which material you use for Post-obturation filling?
    - □ Amalgam □ Composite
    - □ Glass Ionomer Cement □ Any other
33. When do you place the Post-obturation filling?
    - □ Same day □ After 24 hr
    - □ After 7 days □ None
34. Do you prescribe Antibiotics for patients undergoing Endodontic therapy?
    - □ Always □ Often
    - □ Occasionally □ Never
35. How soon after Root canal therapy you advice Crown?
    - □ 7 days □ 14 days
    - □ 21 days □ None

Results:

Of the 230 questionnaires distributed, 152 completed replies were received, which is a 67% response rate. High response rate ensured that this study was representative for the general dental practitioners of the country.

Respondent and practice profile:

The distribution of the respondents according to the years of professional experience is shown in Table I. Years in practice were not evenly distributed amongst the total respondents. The number of the first two groups (0–5 and 6–10) consisted of more than half the total respondents due to the significant increase in the number of graduates in the last 10 years. The training backgrounds and practice profiles of the respondents are listed in Table II. Approximately 78% were in private practice and 22% worked in the government/ university sector, or for non-profit organizations. Fifty six percent respondents carried out five or less root canal procedures weekly.

Patient preparation:

Fifty two percent of the practitioners do not get the consent form signed prior to the treatment.

Vitality of the involved tooth is always checked by 24% followed by 70% of respondents which occasionally perform the vitality tests.

Forty eight percent practitioners occasionally applied topical anaesthesia before injecting the anaesthetic solution while 14% never use anesthetic injection prior to the procedure. Twenty five and twenty three gauge needles are equally common among the practitioners for injecting the anaesthetic solution (Table III).

Emergency appointment:

In case of acute pulpitis or acute alveolar abscess, the choice of treatment among the practioners (80%) is root canal opening with systemic antibiotics and analgesics, while only 20% prescribe the analgesics and antibiotics followed by root canal opening once the acute symptoms subside. About 10% practitioners give open dressing during all endodontic treatment cases, followed by 48% who occasionally practice it.

Table I : Data related to professional experience of the respondents.

Professional experience in year	Percentage
0-5	29.25
6-10	21.4
11-15	17.8
16-20	11.8
>20	19.75

Table II : The training background and practice profile of the respondents

Year of graduation	Type of practice		
	Private (n)	Government/Hospital/ Non-private organizations (n)	Total (n)
1961-80	18	12	30
1981-2000	31	14	45
2001- 10	69	8	77

Table III : Use of Anaesthesia

Use of Topical Anaeshesia	%	Gauge of Needle	%
Always	12	18	0
Often	26	23	42
Occasionally	48	25	48
Never	14	27	10

Table IV : Choice of root-canal irrigants and disinfectant intracanal-medication

Choice of root canal irrigation solution	%	Concentration of NaOCl used	%	Use of Intracanal Medicament	%
NaOCl	52	2%	44	Formocresol	51
Chlorhexidiene	15.32	5%		$Ca(OH)_2$	23
H_2O_2	4.83	Diluted	28	No medicament	26
Saline	24.66				
EDTA	3.16		28		
Distilled Water	2				

Table V : Obturation technique and filling material

Choice of Obturation Technique		Choice of Sealer		Choice of Temporary Filing Material	
Technique	%	Type	%	Type of material	%
Cold lateral compacation	91	$Ca(OH)_2$ base	32	Cavit	27
Vertical compaction	5	ZnOE base	55	ZnOE	57
Others	4	Resin-based	13	IRM(21)	10
		Other	0	GIC	6

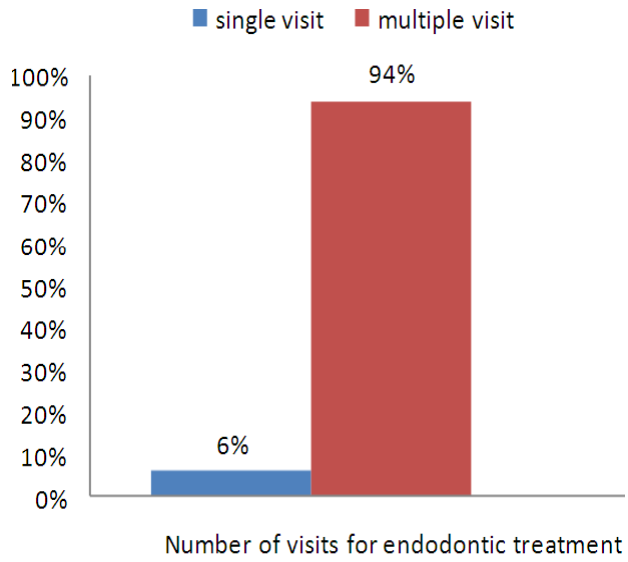

Fig. I: Number of visits per endodontic treatment.

Number of visits per endodontic treatment:

Respondents were asked to give an estimate of the number of visits required to complete the root canal procedures for single-rooted and multi-rooted teeth (Fig. I).

Radiography:

Majority (89%) of practitioners used conventional radiography techniques whilst 11% take the real time images.

Approximately 81% routinely took pre-operative radiographs before commencing endodontic treatments, 16% did so occasionally and 3% rarely did so. Sixty three percent of the practitioners took 3 radiographs for routine root canal treatment and 29% took four radiographs contrary to 8% who took only 2 radiographs. However, 72% reported taking master-cone radiograph while 8% taking no radiograph for determining the master apical cone.

Working length determination:

Approximately 40% of respondents obtained working length radiographically, whereas 38% used radiography in conjunction with an electronic apex locator. About 8% relied on tactile sensation. Sixty six percent of respondents took 0.5mm as working distance short of radiographic apex contrary to 30% which took 1-2mm short of radiographic apex.

Only (4.33%) of the dentists reported using rubber dam routinely to isolate the field of operation during root canal therapy. The majority (95.67%) were infrequent or non-users of rubber dams (Fig. II).

Instrument selection, technique and maintenance:

For locating the canal orifices, endodontic explorer were used by 18% respondents, on contrary to 36% that never used it. Magnifying loupes or operating microscope is occasionally used by 26% while 72% never used them.

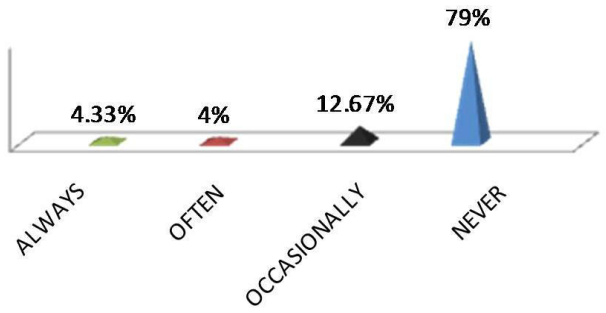

Fig. II : Rubber dam utilization.

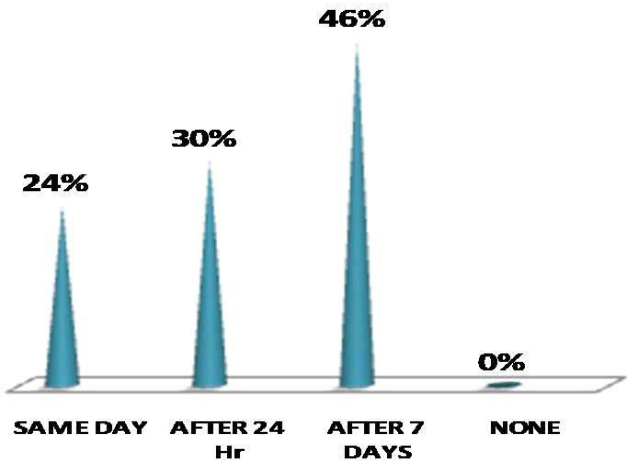

Fig. III: Post- Obturation filling.

For root canal preparation and debridement, 56% used stainless steel hand files and about 15% reported using rotary nickel-titanium instruments. K-files followed by broach were the most popularly used first instrument in the canal (29%). Golden medium files were not used by 94% of the respondents; 66% never used Gates-glidden. Disposal of the endodontic files after single use was practiced by 2% only. Endodontic files were re-used after sterilization with either autoclaves (33%) or cold disinfection (27%) or by glass bead sterlizer (39%).

The majority of dentists (59.66%) instrumented the canal using the step back technique followed by crown down technique (23.66%).

Root canal irrigants:

Many respondents indicated that they used more than one irrigating agent. Sodium hypochlorite and normal saline solutions were the most popular agents, used by 52% and 24.66% respectively. The most popular concentration of sodium hypochlorite was 2% which was used by 44% of the respondents. Other less commonly employed irrigating agents were hydrogen peroxide (4.83%), ethylene diamine tetra acetate (EDTA) (3.16%), and chlorhexidine solutions by (15.32%; Table IV).

Inter-appointment dressing:

About 74% of employed intracanal medicaments for multi-visit treatments. The remaining 26% usually left root canal space unfilled. The medicaments of choice for both vital teeth and necrotic teeth conditions are shown in Table IV. The most common medicament used was tricresol formalin (51%), followed by non-setting calcium hydroxide paste (23%). Root canal treated tooth is infra-occluded by majority of practiotioners (90%).

Obturation technique and materials:

Either cold or warm lateral condensation of gutta-percha with a root canal sealer was used by 91%; others less popular options included warm vertical condensation, thermo-plasticized gutta-percha techniques such as ThermaFil system, continuous waves of condensation technique, Obtura II injectable Gutta-Percha System and a silver-point technique (9%).

The majority of dentists reported the use of a zinc oxide based sealer with the gutta-percha points (55%) followed by a calcium hydroxide based sealer (32%) and resin based sealer(13%; Table V).

Zinc oxide eugenol cement was the most commonly placed temporary filling (57%) followed by Cavit (27%), IRM(10%) and GIC(6%). Dentists reported using amalgam(32%), composite(36%) and GIC(27%) for posterior teeth and composite for anterior teeth as a permanent coronal restorative material (Table IV). Forty six percent of the respondents preferred to wait for 1 weeks after obturation before placing the permanent coronal filling, whilst the remainder placed the restoration immediately(24%) or after one day(30%) of completion of the treatment (Fig. III).

Post-endodontic prosthetic rehabilitation was preferred by 46% after one week, 12% after 14 days, 40% after 21 days and 2% never adviced prosthetic rehabilitation.

Use of systemic antibiotics:

Antibiotics were prescribed for various clinical conditions. Thirty four percent always prescribe antibiotics in conjunction with endodontic therapy whilst, 62% frequently prescribed them. On the contrary to 4% who never prescribed the use of systemic antibiotics.

Endodontic trainings:

Perception about the adequacy of undergraduate endodontic trainings was obtained in this study. About 92% expressed that training in endodontics was inadequate during graduations.

Discussion:

The response rate to questionnaire was 67% which was higher than in many surveys conducted in Western countries. Now a days, endodontic treatment for single rooted or multirooted teeth are conventionally done in a single visit.

In contrast, vast majority of the respondents did not practice single visit root canal treatment. This observation was in agreement with the study undertaken by Tronstad et al (2000) in Sudan. However, a study from the US (Whitten et al, 1996) demonstrated a clear inclination to single visit endodontic treatment, especially in cases without apical periodontitis. Multiple visit endodontic treatment could be a direct result of lacking adequate clinical time to complete the treatment in a single visit. They may prefer to wait till the complete subsidence of pain and other symptoms before obturating the canal system. Another possible explanation could be that the initial visit was used for treating the pain and acute symptoms.

High quality radiographs had been suggested for accurate diagnosis and pre-operative assessment of potentially difficult case to enable appropriate case selection (ESE, 1944). Besides, this pre-operative evidence also constitutes an important dental record. Despite its importance, only about 81% of the surveyed GDPs routinely examine pre-operative radiographs.

The purposes of rubber dam protection are two-fold; primarily to reduce the risk of foreign body inhalation or ingestion by the patient and secondly to provide an aseptic environment for endodontic procedures. Root canal treatment without a rubber dam can be hazardous and is legally indefensible, should aspiration of an instrument occur. In the present study, 79% of GDPSs never used rubber dam and 12.7% used it occasionally in the practice. Tronstad et al (2000) also found low rate (2%) of use of rubber dam in their study. Similar observation were made by Flemish dentists Friedman (2002) & Kirkevang et al (2000). However, 59% of American dentists (Friedman, 2002), 60% of dentists in UK (Whitworth et al, 2000) and 57% of GDPs in New Zealand (Jenkins et al, 2001) reported using rubber dam routinely in endodontic treatment. Furthermore, many dentist use sodium hypochlorite irrigation without a rubber dam, despite knowing that irrigant being caustic and distasteful. Although rubber dam isolation is taught as mandatory during undergraduate training, its importance appears to be ignored by GDPs. Practitioners may equate rubber dam use with the extra cost, additional time, lack of adequate skills or training and absence of patient's acceptability.

In a tooth with an acute pulpitis, the majority of the practitioners perform pulpectomy, while 20% only prescribed analgesics and antibiotics with an acute apical periodontitis without any root-canal instrumentation. It may be that the GDPs' believe that this condition is associated with difficulty in obtaining a satisfactory level of anaesthesia and was the reason they did not carry out any active treatment.

Working length determination is one of the most critical step in endodontics as it facilitates cleaning, shaping and obturation of the root canal system (Weine, 1996). Failure to accurately determine the length of the root canal often results in apical perforation; overextension of irrigants or obturation materials into the peri-radicular tissues, may also lead to incomplete instrumentation and obturation. A majority of the respondents were using the radiographs to determine the working length. This method has inherent inaccuracy, as the apical foramen may not be detectable on radiographs (Olson et al, 1991). Electronic apex locators (EAL) have the advantage of being able to locate the apical foramen (Pagavino et al, 1998; De Moor et al, 1999). Nevertheless, EAL not a substitute for radiographs since the latter provide valuable supplementary information about root canal morphology as well as peri-radicular anatomy. It, therefore, seems logical to combine the use of EALs with radiographs to enable an efficient and accurate determination of working length. This protocol was actually practiced by about one third of respondents surveyed in this study.

Non-rotary manual endodontic files were commonly used by the GDPs. Recently introduced rotary nickel-titanium files have enabled quicker root canal preparation, as these instruments are able to produce a uniformly tapered canal configuration with minimum canal transportation and also reduce the incidences of peri-radicular irritation and post-operative discomfort (Buchanan, 1996). However, unpredictable instrument separation remains a deterrent to their popularity (Martin et al, 2003). Only about one fifth of respondents were using these rotary instruments in root canal preparation.

Sodium hypochlorite has proven to be a most effective antimicrobial agent, an opinion that is shared by 52% of respondents. The same result was demonstrated amongst dentists in Switzerland (Gatewood et al, 1990), because of its effective antimicrobial and tissue solving action (Pitt Ford, 1983). Many clinicians prefer diluted concentrations of sodium hypochlorite because of its irritant action.

The step back technique was the most popular canal preparation technique among general dental practitioners. The conventional (push-pull) technique, on the other hand, was used by 12.66% of the respondents. Sixty percent of Flemish dentists used the standard filing technique (Qualtrough et al, 1999). Generally, dentists use hand instruments and were not inclined to use more advanced engine driven techniques for shaping the root canal system.

Despite the fact that calcium hydroxide is recognized as the standard intracanal medicament for inter-appointment dressing (Slaus et al, 2002), it was used by only 23% of the respondents. Half of GDPs used formaldehyde containing materials. This finding is consistent with the findings of Tronstad et al (2000). Although formaldehyde containing products have been used for their antimicrobial and fixative properties, they are toxic to periradicular tissues and may have mutagenic and carcinogenic potential (Slaus et al, 2002). The use of calcium hydroxide, as intracanal medication, should be encouraged among dentists, as it is effective against most root canal pathogens , control pain, reduce inflammation, and dry wet canals (Bystrom et al, 1985).

Root canal obturation serves to prevent the ingress of microorganisms into the already cleaned root canal system. Majority of the GDPs use cold lateral compaction of gutta-percha to obturate the root canal space. Dentists are not strong advocates of the more recently introduced advanced obturation techniques. This may be attributed to additional cost involved or the lack of skill and training.

According to ESE (1994) guidelines, sealers should be biocompatible. It was found out that most private practitioners used non-medicated zinc oxide-eugenol root-canal cements.

Temporary restorative materials used in endodontics must provide a high quality seal of the access preparation to prevent microbial contamination of the root canal. Twenty-seven percent of the respondents use Cavit as temporary filling material, which under experimental conditions provided superior resistance to bacterial leakage (Beach et al, 1996).

Systemic antibiotics are indicated only if there has been systemic spread of infection. Otherwise, they may present more of a risk to the patient than the local infection. There is evidence that antibiotics are prescribed inappropriately in general dental practices (Palmer et al, 2000). Recent reviews revealed that systematic antibiotics alone offer no additional benefit in the management of acute apical periodontitis and acute abscesses in permanent dentition (Mathews et al, 2003). With the increasing worldwide problem of antimicrobial resistance, there is a need to rationalize prescription of antibiotics.

Conclusions:

Endodontics is a dynamic, evolving discipline with considerable advances in techniques and materials over the last decade. The present small-scale study may not necessarily represent the true picture, however, it can be used as reference for a larger survey in the future.

This study demonstrated that dentists performed procedures which often deviated from well acknowledged endodontic quality guidelines and is often in general practice carried out under less than optimal conditions.

This survey shows the importance of establishing higher specialist training or continuing dental education for practitioners to update their knowledge. There is a need to promulgate the latest concepts and practices of endodontics not only for the undergraduate students but also for general dental practitioners.

References:

1. Al-Omari WM: Survey of attitudes, materials and methods employed in endodontic treatment by general dental practitioners in North Jordan. *Bio Medical Central, Oral Health*, 2004;4:1
2. Beach CW, Calhoun JC, Bramwell JD, Hutter JW, Miller GA: Clinical evaluation of bacterial leakage of endodontic temporary filling materials. *Journal of Endodontics,* 1996; 22(9): 459-462.
3. Buchanan LS. The art of endodontics: files of greater taper. *Dentistry Today,* 1996;15:42,44-46,48-49.
4. Bystrom A, Claesson R, Sundqvist G: The antibacterial effect of camphorated paramonochlorophenol, camphorated phenol and calcium hydroxide in the treatment of infected root canals. *Endodontic & Dental Traumatology*, 1985;1(5):170-175.

5. Chan AWK, Low D, Cheung GSP, Ng RPY: A questionnaire survey of endodontic practice profile among dentists in Hong Kong. *Hong Kong Dental Journal*, 2006;3(2):80-87.
6. De Moor RJG, Hommez GMG, Martens LC, De Boever JG: Accuracy of four electronic apex locators: an *in vitro* evaluation. *Dental Traumatology*, 1999;15(2):77-82.
7. European Society of Endodontology: Consensus report of the European Society of Endodontology on quality guidelines for endodontic treatment. *International Endodontic Journal,* 1994;27(3):115-124.
8. Friedman S: Considerations and concepts of case selection in the management of post-treatment endodontic disease (treatment failure). *Endodontic Topics*, 2002;1(1):54-78.
9. Gatewood RS, Himel VT, Dorn SO: Treatment of the endodontic emergency: a decade later. *Journal of Endodontics*, 1990;16(6):284-291.
10. Jenkins SM, Hayes SJ, Dummer PM: A study of endodontic treatment carried out in dental practice within the UK. *International Endodontic Journal*, 2001;34(1):16-22.
11. Kirkevang LL, Ørstavik D, Hørsted-Bindslev P, Wenzel A: Periapical status and quality of root fillings and coronal restorations in a Danish population. *International Endodontic Journal*, 2000;33(6):509-515.
12. Martin B, Zelada G, Varela P, Bahillo JG, Mogan F, Ahn S, Rodriquez C: Factors influencing the fracture of nickel-titanium rotary instruments. *International Endodontic Journal*, 2003;36(4):262- 266.
13. Matthews DC, Sutherland S, Basrani B: Emergency management of acute apical abscesses in the permanent dentition: a systematic review of the literature. *Journal of Canadian Dental Association*, 2003;69(10):660.
14. Olson AK, Goerig AC, Cavataio RE, Luciano J: The ability of the radiograph to determine the location of the apical foramen. *International Endodontic Journal*, 1991;24(1):28-35.
15. Pagavino G, Pace R, Baccetti T: A SEM study of *in vivo* accuracy of the Root ZX electronic apex locator. *Journal of Endodontics,* 1998;24:438-441.
16. Palmer NA, Pealing R, Ireland RS, Martin MV: A study of therapeutic antibiotic prescribing in National Health Service general dental practice in England. *British Dental Journal*, 2000;188(10):554-558.
17. Pitt Ford TR: The practice of endodontics by different groups of dentists in England. *International Endodontic Journal*, 1983;16(4):185-191.
18. Qualtrough AJ, Whitworth JM, Dummer PM: Preclinical endodontology: an international comparison. *International Endodontic Journal*, 1999;32(5):406-414.
19. Slaus G, Bottenberg P: A survey of endodontic practice amongst Flemish dentists. *International Endodontic Journal*, 2002;35(9):759-767.
20. Tronstad L, Asbjörnsen K, Doving L, Pedersen I, Eriksen HM: Influence of coronal restorations on the periapical health of endodontically treated teeth. *Endodontic & Dental Traumatology,* 2000;16(5):218-221.
21. Weine FS: Calculation of working length.In: Endodontic therapy. 5th Edn.; Mosby, St. Louis; 1996:395-422.
22. Whitten BH, Gardiner DL, Jeansonne BG, Lemon RR: Current trends in endodontic treatment: report of a national survey. *Journal of the American Dental Association*, 1996;127(9):1333-1341.
23. Whitworth JM, Seccombe GV, Shoker K, Steele J G: Use of rubber dam and irrigant selection in UK general dental practice. *International Endodontic Journal*, 2000;33(5):435-441.

Source of Support : Nil.
Conflict of Interest: None declared.

Case Report

Cutaneous Intravascular Papillary Endothelial Hyperplasia of the Forearm : A Case Report

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(Received October, 2012) (Accepted April, 2013)

Abstract:

Intravascular papillary endothelial hyperplasia (IPEH) or reactive vascular endothelial lesion is a rare benign condition and is also known as Masson's haemangioma. Blood vessel injury or venous thrombosis may predispose to this condition. Distinction of reactive entities from neoplastic condition like angiosarcoma is important. A case of cutaneous IPEH in forearm of an adult male is being reported here.

Key Words: Masson's Haemangioma, Angiosarcoma, Intravascular papillary endothelial hyperplasia (IPEH).

Introduction:

It was first described by Masson (1861) in hemorrhoidal vessels as "Vegetant intravascular hemangioendothelioma." Albrecht & Kahn (1990) studied immunohistochemistry of IPEH and concluded that it is an exuberant organization and recanalization of a thrombus. Kuo et al (1976) noted its occurance in previously normal vessels or in varices, hemarrhoids, hematomas, pyogenic granulomas and hemangiomas. Intravascular papillary endothelial hyperplasia is considered to be a reactive vascular proliferation following traumatic vascular stasis. A clinico-pathologic study of 91 cases done by Hashimoto et al (1983) noted that it simulates angiosarcoma because of the presence of papillary formation, anastomosing vascular channels and plump endothelial cells. It is identified because of the exclusive intravascular nature of the process, the lack of necrosis, bizarre cells and atypical mitosis, the characteristically fibrinous and/or hyaline (deeply eosinophilic) appearance of the papillary stalks and the frequent finding of residual organizing thrombi. It is a rare benign condition simulating angiosarcoma hence it is being reported here.

Case Report :

A 21years old male presented in surgical OPD with verucous growth on left forearm. Physical examination revealed no other abnormal finding. The vital signs were all normal.

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All laboratory findings were within normal limit. Exision of tumour mass was done and sent for histopathology examination.

On gross examination several irregular black to brownish tissue pieces collectively measuring 1x0.8x0.5c.m. were received.

Histological examination revealed large to medium sized blood sinuses with organising thrombus, within which anastomosing vascular proliferating channels were also seen. These channels were lined by plump endothelial cells. At places, papillary appearance with fibrinuous and hyaline stalks were also seen. After extensive examination in multiple sections, necrosis, bizarre cells or atypical mitosis were not seen. After exclusion of a malignant vascular lesion, a diagnosis of intravascular papillary endothelial hyperplasia (Masson's hemongioma) of the fore arm (Fig. I & Fig. II) was made.

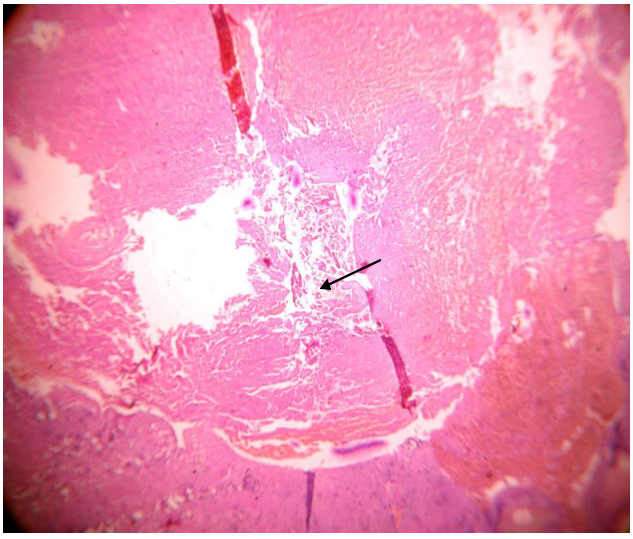

Fig. I : Dilated blood vessel with intravascular papillary formation (H & E, 100X).

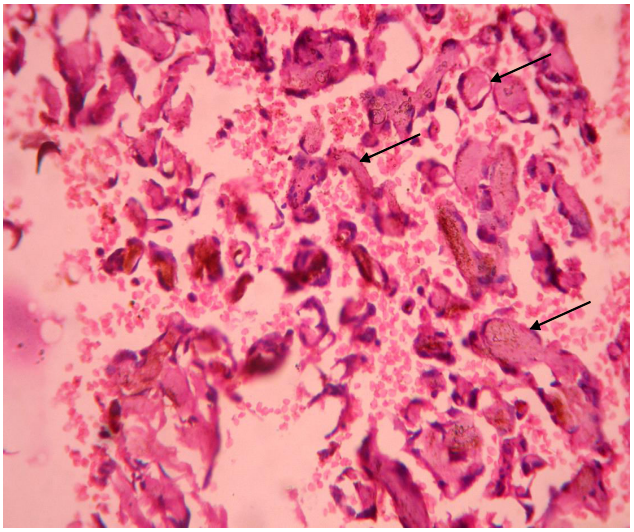

Fig. II: The papilla with hyalinized stalks is covered with plump endothelial cells (H & E, 400X).

Discussion:

Intravascular papillary endothelial hyperplasia or Masson's hemangioma is now considered as benign intravascular process that have resemblance to a angiosarcoma. Masson (1861) considered the lesion as a neoplastic condition as it was a proliferative lesion of endothelial cells. Clearkin & Enzinger (1976) termed this lesion as "intravascular papillary endothelial hyperplasia" (IPEH). There are numerous synonyms for IPEH such as intravenous atypical vascular proliferation, intravascular angiomatosis, intravascular endothelial proliferation, Masson's pseudoangiosarcoma and Masson's lesion (Murugaraj et at, 2010; Guvena et al, 2008). However, its exact pathogenesis remains uncertain. Gupta et al (2005) suggested that some of the hyperplastic endothelial cells in IPEH are vascularized and granulation tissue is formed during the process of organization of thrombus. In the present case lesion occured in thrombosed vein of forearm. Barr et al (1978) observed that IPEH has characteristic exuberant endothelial proliferation within the lumen of medium sized veins. Microscopically, the tuft like papillary proliferation of endothelial cells was always intimately associated with a thrombus. It seem to represent a peculiar structure and exuberant endothelialization of intravascular papillary endothelial hyperplasia which necessitate ruling out angiosarcoma. The following features are important in the differential diagnosis:

(1) Intravascular papillary endothelial hyperplasia is often well circumscribed or encapsulated.

(2) The proliferation process is limited completely to the intravascular spaces.

(3) Though the endothelial cells are hyperchromatic, extreme nuclear atypia and frequent mitotic figures are not seen.

(4) Papillae are composed of fibro-hyalinized tissue of two or more endothelial cell layers without any covering.

(5) Tangential sectioning may reveal pseudochannels but no irregular and anastomosing blood vessels are seen in the stroma.

(6) Necrosis is an unusual finding in intravascular papillary endothelial hyperplasia.

In literature desmographic predilection were not reported so far. But Makos & Nikolaidou (2004) studied intravascular endothelial papillary hyperplasia in oral mucosa and noted that the lesion was more frequent in female than in males with females to male ratio being 1.3:1 In the present case it was in a male patient. Kuo et al (1976) and Park et al (2000) stated that IPEH occurs most frequently in the head and neck, fingers, trunk and cutaneous veins as a small firm, superficial mass with red to blue discolourtion of the overlying skin. In the present case it was present at an unusual site ie. forearm and was presented with discolouration of the overlying skin.

Intravascular endothelial hyperplasia in forearm is unusual and histopathology is essential to distinguish it from more alarming lesion of angiosarcoma.

References:

1. Albrecht S, Kahn HJ: Immunohistochemistry of intravascular papillary endothelial hyperplasia. *Journal of Cutaneous Pathology,* 1990; 17(1):16-21.
2. Barr RJ, Graham JH, Sherwin LA: Intravascular papillary endothelial hyperplasia. A benign lesion mimicking angiosarcoma. *Archives of Dermatology,* 1978;114(5) : 723-726.
3. Clearkin KP, Enzinger FM: Intravascular papillary endothelial hyperplasia. *Archives of Pathology and laboratory Medicine,* 1976; 100(8); 441-444.
4. Gupta S, Nigam S, Chaturvedi KU: Masson's tumor. A lesion of uncertain histogenesis. *Indian Journal of Dermatology,* 2005;50(2);77-79.
5. Guvenc MG, Derekolylu L, Korkut N, Oz F, Oz B: Intravascular papillary endothelial hyperplasia (Masson lesion) of the hypopharynx and larynx. *Ear Nose Throat Journal,* 2008;87(12): 700-701.
6. Hashimoto H, Daimaru Y, Enjoji M: Intravascular papillary endothelial hyperplasia : a clinicopathologic

study of 91 cases. *American journal of Dermatopathology,* 1983 ; 5(6) : 539-546.
7. Kuo TT, Sayers CP, Rosai J: Masson's 'Vegetant intravascular hemangioendothelioma." a lesion often mistaken for angiosarcoma. Study of seventeen cases located in the skin and soft tissue. *Cancer,* 1976;38(3);1227-1236.
8. Makos CP, Nikolaidou AJ: Intravascular papillary endothelial hyperplasia (Masson's tumor) of the oral mucosa. Presentation of two cases and review. *Oral oncology Extra,* 2004; 40(4-5); 59-62.
9. Masson P: Hemangioendothelioma vegetant intravasculaire. In: Bulletin de la societe Anatomique de paris (Anatomic Normale-Anatomic Pathologique-clinique), 1861.
10. Murugaraj V, Kingston GT, Patel M, Anand R: Intravascular papillary endothelial hyperplasia (Masson's tumor) of the oral mucosa. *British Journal of Oral and Maxillofacial Surgery,* 2010;48(4):16-17.
11. Park SJ, Kim HJ, Park SH, Yeo UC, Lee ES. A case of intravascular papillary endothelial hyperplasia on upper lip. *Korean Journal of Dermatology*, 2000;38(12): 1693-1695.

Source of Support : Nil.
Conflict of Interest: None declared.

Case Report

Efficacy of First Trimester Ultrasound in the Early Diagnosis of Abdominal Pregnancy

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(Received October, 2012) (Accepted May, 2013)

Abstract:

Abdominal pregnancy is a rare type of ectopic pregnancy that implants in the peritoneal cavity, other than the fallopian tube & ovary. It is very difficult to diagnose both clinically & radiologically in early gestational period. Cases described in the literature were diagnosed in late gestational period.

The present case was of a young female who presented with intermittent, lower abdominal pain, abnormal foetal movements with a history of abnormal foetal position on clinical examination. On antenatal sonography, a live foetus of 18-19 weeks was seen outside the uterus in peritoneal cavity.

Key Words: Abdominal pregnancy.

Introduction:

An extra-uterine abdominal pregnancy is a very uncommon form of ectopic pregnancy. It is defined as ectopic pregnancy that implants in the peritoneal cavity outside the fallopian tubes & ovary. It is estimated to occur in10 out of 100,000 pregnancies. (Atrash et al, 1987).

An abdominal pregnancy is usually self limited in early gestational period due to hemorrhage from trophoblastic invasion with complete abortion of the gestational sac.

The diagnosis is frequently missed clinically & radiologically, during antenatal care. However, it is very important to detect an extra-uterine abdominal pregnancy due to associated high maternal mortality rate which is about five per 1000 cases and is approximately seven times higher than the estimated rate of ectopic pregnancy in general.

Careful antenatal ultrasound examination of gravid uterus in case of clinically suspected abdominal pregnancy proves to be immensely useful to make a diagnosis & avoid associated complications.

Here the author reports a rare case of live abdominal pregnancy diagnosed in the first trimester by ultrasound.

Case Report :

A 25 year old lady was admitted with the history of amenorrhoea of 4 months & pain in abdomen since one week. She was admitted in the hospital with the diagnosis of threatened abortion with severe anemia. Patient was treated conservatively. On physical examination her general condition was found to be stable with pulse rate of 90 per minute, Blood pressure 100/70 mm. of Hg; pallor was present. Her systemic examination was within normal limits. On per abdominal examination, uterus was found to be of 18 weeks size and foetal parts were felt superficially.

On per vaginal examination, Os was closed, whole foetus was felt in pouch of Douglas; cervix & uterus were felt separately from the foetus.

Trans-abdominal ultrasound was performed. Sonography revealed a single live foetus of 18 weeks 4 days, seen posterior to uterus. The uterine cavity was empty. The foetus & the placenta were seen separately from the uterus. Placenta was adherent to surrounding bowel loops. Foetus was seen in a flexed position. No free movement of foetus was noted, during examination. Trans-abdominal sonographic findings were confirmed by trans-vaginal sonography which was showing more clear interface between uterus & foetus. The diagnosis of abdominal pregnancy was made (Fig. I & II).

Patient was taken to operation theater; laprotomy was performed with mid line incision. Hemoperitonam was observed. A live foetus of 19 week size was seen in the pouch of douglas.

Placenta was found to be adherent to bowel & infundibulo-pelvic ligament on left side. Foetus was removed, cord cut & placenta left in situ.

The treatment of abdominal pregnancy is laprotomy with removal of foetus; placenta is to be left in situ. Placenta involution was done with

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Fig. I: Photograph showing Extra uterine fetus lying posterior to uterus (trans abodominal sonography)

Fig. II: Photograph showing extra uterine fetus on trans vaginal sonography.

Fig. III: Photograph showing fetus post-operatively.

methotrexate & monitored by ultrasonography & human chorionic gonadotropin (HCG) level (Fig. III).

Discussion:

According to implantation site, abdominal pregnancy is classified into two types:

Primary abdominal pregnancy which means implantation of fertilized ovum directly in the abdomenal cavity with intact fallopian tubes & ovaries (Dahiya & Sharma, 2007). Secondary abdominal pregnancy occurs following tubal abortion & re-implantation within the abdomen. (Selo Ojeme & GoodFellow, 2002). It is associated with evidence of tubal or ovarian damage.

The incidence of abdominal pregnancy is 1 in 10,000 live births. The maternal mortality rate is 0.5 to 8% & perinatal mortality rate is between 40% to 95% (Martin et al, 1988).

Diagnosis of abdominal pregnancy require high index of clinical suspicion. History & physical examination is often inconclusive. The patient usually presents with abdominal pain, painful foetal movements and sometimes decreased foetal movements. Clinical examination reveals abnormal lie of foetus & palpation of pelvic mass distinct from uterus. Diagnosis by ultrasound is missed in half of the cases (Desai et al, 2005). However, careful sonographic examination in background of high clinical suspicion, makes the right diagnosis. Both trans-abdominal & trans-vaginal sonographic examinations are very useful in the first trimester of pregnancy to differentiate extra from intra abdominal pregnancy.

In the present case the main sonographic findings were abnormal position & decreased foetal movements, and an abnormal position of placenta, visualization of uterus away from the foetus. Foetal skull and other parts were seen overlying the maternal spine on lateral radiograph (Costa et al, 1991).

Magnetic resonance imaging help in localizing the area of implantation of the placenta, its vascular supply & position of the fetus (Harris et al, 1988).

Conclusion:

Extra-uterine abdominal pregnancy is a rare form of ectopic pregnancy. Proper clinical history, physical examination with high suspicion and dedicated antenatal ultrasound examination is very useful to make correct diagnosis. It is associated with high maternal mortality rate. Magnetic Resonance Imaging (MRI) is highly specific than other imaging modality, but high cost & lack of wide availability is the disadvantage. It

could be concluded that careful antenatal ultrasound examination prove to be very useful in proper diagnosis in clinically suspected pregnancy cases of abdominal pregnancies.

References:

1. Atrash HK, Friede A, Hogue CJR: Abdominal pregnancy in the United States: Frequency & Maternal Mortality. *Obstetrics & Gynecology*, 1987;69:333- 337.
2. Costa SD, Presley J, Bastert G : Advanced abdominal pregnancy. *Obstetrical & Gynecological Survey*, 1991;46(8):515-525.
3. Dahiya K, Sharma D: Advanced abdominal pregnancy: A diagnostic & management dilemma. *Journal of Gynecologic Surgery,* 2007;23(2):69-72.
4. Desai BR, Palted SS, Pujar YV, Ruge J: Advanced secondary abdominal pregnancy following rupture of rudimentary horn. *The Journal of Obstetrics & Gynecology India*, 2005; 55(2):180
5. Harris MB, Augtuaco T, Frazier CN, Mattison DR: Diagnosis of a viable abdominal pregnancy by magnetic resonance imaging. *American Journal of Obstetrics & Gynecology*, 1988;159(1): 150-151.
6. Martin JN (Jr), Sessums JK, Martin RW, Pryor JA, Morrison JC : Abdominal pregnancy current concepts of management. *Obstetrics & Gynecology*, 1988;71(4): 549-557.
7. Selo Ojeme DO, GoodFellow CF: Simultaneous intrauterine and ovarian pregnancy following treatment with clomiphene citrate. *Archives of Gynecology & Obstetrics*, 2002; 266(4):232-234.

Source of Support : Nil.
Conflict of Interest: None declared.

Case Report

Arteriovenous Malformation in Crouzon Syndrome: A Case Report

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(Received April, 2013) (Accepted June, 2013)

Abstract:

Crouzon syndrome, a hereditary syndrome of craniofacial dysostosis, is a triad of skull deformities, facial anomalies and exophthalmos . It accounts for approximately 4.8% of all cases of craniosynostosis with the prevalence of approximately 1 per 25,000 live births worldwide. This is a case of Crouzon syndrome with arteriovenous malformation over vertex which has not been reported so for in the literature.

Key Words: Craniosynostosis, Crouzon syndrome, Arteriovenous malformation.

Introduction:

Craniosynostosis is a condidition where baby is born with, or develop later on one or more fused cranial suture resulting in skull deformities and the disturbances in the normal brain development. Most of the patients are nonsyndromic but it could be associated with more than 130 different syndromes. Some of the syndromes associated with craniosynostosis are Apert syndrome, Crouzon syndrome, Pfeiffer syndrome and Saethre-Chotzen syndrome.

Crouzon syndrome was first described by a French neurologist, Octave Crouzon (Crouzon, 1912). It is a hereditary syndrome of craniofacial dysostosis which includes a triad of skull deformities, facial anomalies and exophthalmos. It is also known as dysostose cranio- faciale herèditare or dysostosis cranio-facialis.

Case Report:

A four and a half year old boy presented in Paediatric OPD with complaints of abnormal shape of head with bulging of eyeballs. He also complained of snoring and nasal stuffiness for last two years. He was a full term baby, delivered by normal vaginal route in hospital and cried immediately after birth. There was no history of consanguinity in parents. No other family member or sibling was affected with the same complaints. He was fully vaccinated. His development was appropriate for his age. He did not have any symptoms of raised intracranial hypertension like headache or vomiting.

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On examination, his vital parameters were normal and his anthropometric measurements (Weight -10.64 kg, Height -95 cm, Head Circumference - 46.5 cm) were below 3rd percentile. His head was small and triangular in shape; he had bilateral proptosis, hypertelorism and low set ears (Fig. I). His nasal bridge was depressed and teeth were overcrowded. There was a pulsatile boggy swelling present at vertex measuring approximately 3cmX3cm. Extremities were normal and there was no syndactyly or polydactyly. His ENT examination revealed deviated nasal septum. Ophthalmology evaluation reported normal vision, telecanthus and exotropia. His dental examination showed normal dentition with no enamel-dentine hypoplasia. He had class 3 lower jaw protrusion and caries in upper incisors. His respiratory, cardiovascular and nervous systems were within normal limits.

On investigation, his haemogram was normal. X-Ray skull showed fused sutures, copper beaten appearance and class 3 lower jaw protrusion and maxillary hypoplasia (Fig. II). Computerized tomography of head also showed bilateral fused lambdoid, sagittal, coronal and metopic sutures (Fig. III). Orbits were small and eyeballs were protruded. There was a small bony defect at posterior fontanelle area. Ultrasonography with Doppler of the boggy swelling showed it to be an arteriovenous malformation (AVM) communicating through the defect in cranium (Fig. IV).

He was diagnosed as a case of Crouzon Syndrome with arteriovenous malformation. He was given medical therapy for snoring to which he responded very well. He was referred to Pedodontist for dental caries and jaw abnormality and was advised for regular follow up.

Fig. I: Photograph showing small triangular head, bilateral proptosis, low set ears and small nose.

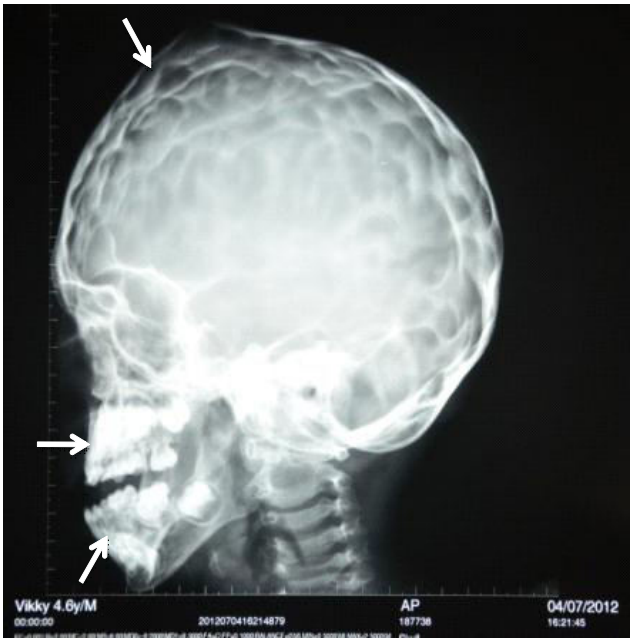

Fig. II: Photograph showing trigonocephaly, fused sutures, copper beaten appearance, small maxilla and protruded lower jaw.

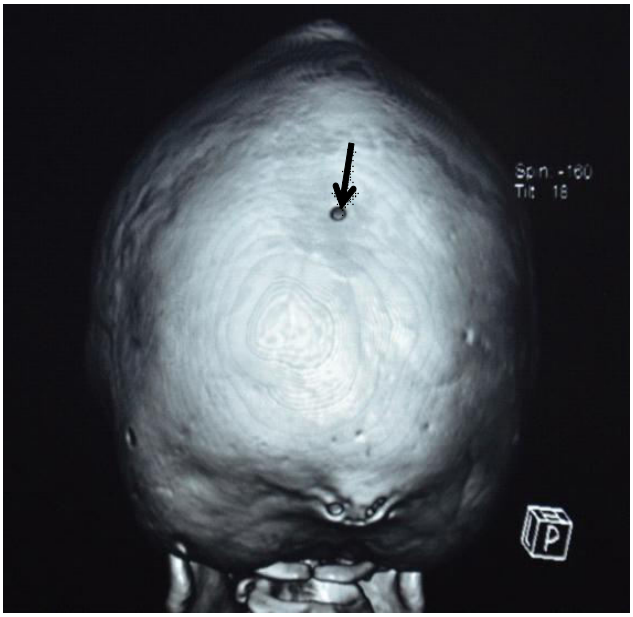

Fig. III: Photograph showing bilateral fused sutures and small defect in cranium

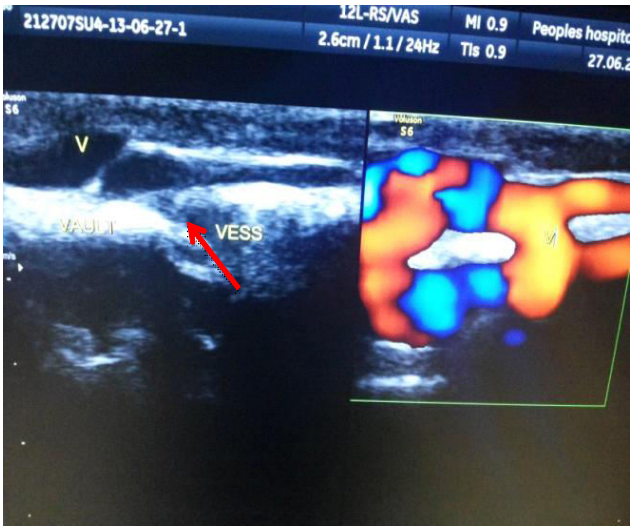

Fig. IV: USG doppler showing arteriovenous malformation seen through a bony defect on vault.

Discussion:

Craniosynostosis is a condidition where baby is born with or develop fusion of one or more cranial suture in first one or two years of life. This results in skull deformities and the disturbances in the normal brain development due to the reduced volume of the intracranial space. This developmental anomaly affects 1 in 2000 children.

The six cranial sutures most commonly affected in craniosynostosis are: - Two coronal sutures, two lambdoid sutures, sagittal suture and metopic suture. Fused sutures act as a barrier to the brain growth perpendicular to it, so the compensatory growth occurs along the lines of adjacent sutures to accommodate the growing brain and this leads to abnormal shape of the head.

Major complications associated with craniosynostosis are inhibition of brain growth, hydrocephalus, raised intracranial pressure, delayed development, cognitive defect, eye problems, psychosocial and cosmetic problems.

Crouzon syndrome, first described in 1912, is an autosomal dominant genetic condition, though 25%

Table I: Clinical features of crouzon syndrome:

Head	Brachycephaly, dolichocephaly, Trigonocephaly, ridges felt at sutural lines
Brain	Hydrocephalus, raised intracranial pressure, Arnold Chiari malformation
Eyes	Exophthalmos, hypertelorism, reduced monocular visual acuity, reduced binocular visual acuity, amblyopia, optic atrophy, ametropia and hypermetropia, myopia, Manifest strabismus, keratopathy, astigmatism, anisometropia, exotropia and esotropia
Nose	Small beaked nose, Deviated nasal septum
Mid-face	Mid-face retrusion
Jaw	Relative mandibular prognathism
Ears	Low set ears, conductive hearing loss, external, middle and inner ear abnormality
Mouth	High arched palate, overcrowding of teeth, class III malocclusion
Spine	Cervical spine abnormality, fusion of cervical vertebra, scoliosis
Respiratory system	Upper airway obstruction, mouth breathing, sleep apnoea, snoring
Cutaneous	Acanthosis nigricans
Intelligence	Normal in most cases

of cases occur as a fresh mutation. The molecular analysis of craniosynostosis syndromes identifies mutations in the fibroblast growth factor receptor 2 (FGFR2) gene, located at 10q25-q26 (Reardon et al, 1994)). In patient of Crouzon syndrome with acanthosis nigricans the mutation is found in FGFR 3 gene. All the mutations were paternal in origin. Advanced paternal age was noted for the father of patient with Crouzon syndrome or Pfeiffer syndrome, compared with the fathers of control individuals. However, in the present case, the age of father was 30 years when patient was born.

Abnormalities of the head shape in Crouzon syndrome depends on the sutures involved. The most common clinical appearance is brachycephaly as it was seen in the present case. Fusion of the sutures present at base of skull leads to midfacial hypoplasia, maxillary hypoplasia, small shallow orbits and small nasal cavity which in severe cases can lead to upper airway obstruction or sleep apnoea (Table I). Snoring present in this case also suggested midfacial hypoplasia. The difference between Crouzon syndrome and other syndrome is that it is not associated with hand and feet abnormality like syndactyly or polydactyly. In the present case apart from the usual clinical features present in Crouzon syndrome, there was a large AVM present at the vertex. Even after careful literatre search, we could not find a single case with this association.

Management of Crouzon Syndrome:

Surgical intervention is mandatory to prevent complications like optic atrophy and to permit the brain to grow. Before subjecting the patient for surgery certain investigations are required for individualised treatment plan. They include CT scan head, X- Ray spine, dental X- Rays, visual and auditory evaluation. Surgery is aimed not only to improve function but to enhance the cosmetic appearance. Craniofacial surgery requires a team of plastic surgeon, neurosurgeon, maxillofacial surgeon, otolaryngologist and eye surgeon.

Imai et al (2013) showed orbital volume to be smaller in patients of Crouzon syndrome than in the Apert syndrome. Though orbit expansion following fronto-orbital advancement did not fully restore normal orbital volume, but in most cases, it was useful for alleviation of preoperative symptoms like exophthalmos, corneal erosion and conjunctivitis.

Surgical treatment varies according to the presentation of the disease and usually begins during a child's first year with fronto-orbital advancement with cranial decompression. Subsequently correction of midfacial hypoplasia needs Le Fort III osteotomy or its segmental variants, monobloc frontofacial advancement, or bipartition osteotomy (Scafati et al, 2008).

Apart from various surgeries, child may require medical support like gavage feeding, eye care to prevent keratitis, speech therapy, preventive dental care, eyeglasses to correct the vision and hearing aids. The present case had snoring during sleep which responded to medical management and did not require surgery. Filiaci et al (2013) also reported sleep disorder breathing (SDB) as 2 % for Obstructive Sleep Apnoea Syndrome and 7-8% for snoring.

Facial deformities greatly affect the social and emotional development of the affected child (Pandey et al, 2012). Family should be provided social, psychological and professional support. The adolescent years are difficult to manage with the situation. Regular meeting of parents and affected child with other families having similarly affected child will help both to cope with the problem.

A well coordinated multidisciplinary approach and timely surgery usually gives good result and a patient of Crouzon syndrome can live a normal life.

References:

1. Crouzon LE: Dysostose cranio-faciale héréditaire. *Bulletin de la Société des Médecins des Hôpitaux de Paris*, 1912: 33: 545-555.
2. Filiaci F, Riccardi E, Ungari C, Agrillo A, Quarato D: Variation of the upper airways in pediatric patients with OSAS and retrusion of the midface. *Annali Italiani De Chirurgia*, 2013;31:84.
3. Imai K, Fujimoto T, Takahashi M, Maruyama Y, Yamaguchi K: Preoperative and postoperative orbital volume in patients with crouzon and apert syndrome. *The Journal of Craniofacial Surgery,* 2013; 24(1):191-194.
4. Pandey N, Pandey RK, Singh RK, Shah NK: Crouzon syndrome: a social stigma. *BMJ Case Reports,* 2012;10:2012.
5. Reardon W, Winter RM, Rutland P, Pulleyn LJ, Jones BM, Malcolm S: Mutations in the fibroblast growth factor receptor 2 gene cause Crouzon syndrome. *Nature Genetics*, 1994; 8(1): 98-103.
6. Scafati TC, Aliberti F, Scafati ST, Mangone GM, Scafati MT: The value of the maxillo-malar osteotomy in the treatment of Crouzon syndrome with exorbitism. *Annals of Plastic Surgery*, 2008;61(3):285-289.

Source of Support : Nil.
Conflict of Interest: None declared.

Case Report

Typhoid Perforation of Gallbladder- A Rare Pathology

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(Received March, 2013) (Accepted June, 2013)

Abstract:

Surgical complication of Typhoid fever when occurs, it commonly involves gut rather than the gallbladder. This is a case report of 24 years young male who came to emergency with the complaint of fever of 12 days duration and sudden severe pain in the abdomen for 2 days. Patient was evaluated and investigated. He underwent laparotomy; on laprotomy, gallbladder was found to have perforation and therefore, cholecystectomy was done. The investigations supported the diagnosis of Typhoid fever. Patient recovered uneventfully and was discharged after 10-days.

Key Words: Perforation peritonitis, Gallbladder, Typhoid.

Introduction:

Typhoid infection is common in this region of our country. It is a common cause of intestinal perforation resulting in high morbidity and mortality (Archampong, 1976 ; Ugwu et al , 2005) . Among the various complications of this condition, gallbladder perforation is uncommon and has high mortality if not managed promptly. Acute abdominal pain is one of the common presentations in emergency but the diagnosis of gallbladder perforation is infrequently considered in the absence of pre-existing gallbladder disease. The clinical presentation of gallbladder perforation may range from acute generalized peritonitis to non-specific abdominal presentations. Often the radiological investigations may not detect this pathology so as to make an early diagnosis.

Case Report:

A 24 year male presented to the Emergency of People's Hospital with fever of twelve days duration and moderate abdominal pain. Two days prior to his admission he had severe abdominal pain with two episodes of vomiting. He was hemodynamically stable. The abdominal examination showed distension, diffuse tenderness and guarding. Abdominal X-ray showed mildly distended bowel- loops without any gas-fluid levels or free peritoneal gas; chest radiograph was within normal limits and there was no free gas under the diaphragm. Abdominal sonography revealed moderate ascites with internal septation. Wall of the gall bladder was found to be thickened and thick echogenic sludge was seen within it. Laboratory reports documented a white blood cell count of 9,500 cu/mm with 85% neutrophils and liver function tests were within normal limits. The widal test was positive for 'O' & 'H' antigen in high titres.

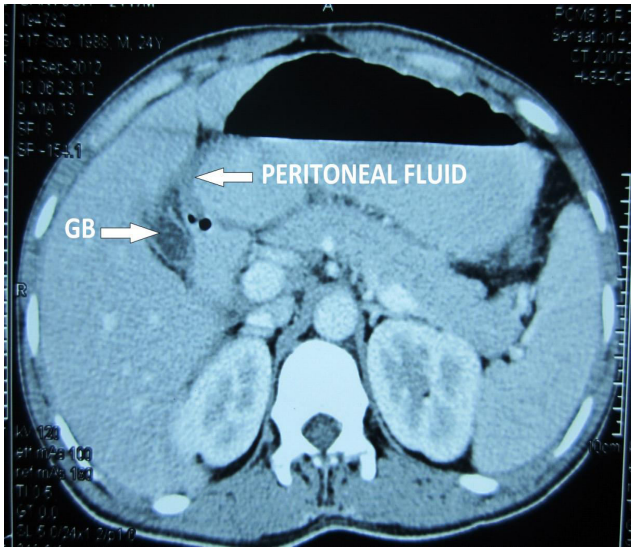

Fig. I: Photograph showing collapsed gallbladder and fluid in peritoneal spaces

A contrast enhanced computerized tomography scan of the abdomen suggested fluid accumulation in the perihepatic, subphrenic, and both paracolic gutters; collapsed gallbladder with poor definition of its thickened wall, two air pockets within the pericholecystic fluid; enlarged mesenteric lymph nodes and mild hepato-splenomegaly.

In view of signs of generalized peritonitis, laparotomy was planned. During surgery, 1.5-2 litre of bile stained peritoneal fluid was drained. While evaluating the duodenum, a moderately inflammed gall bladder was seen with a perforation of

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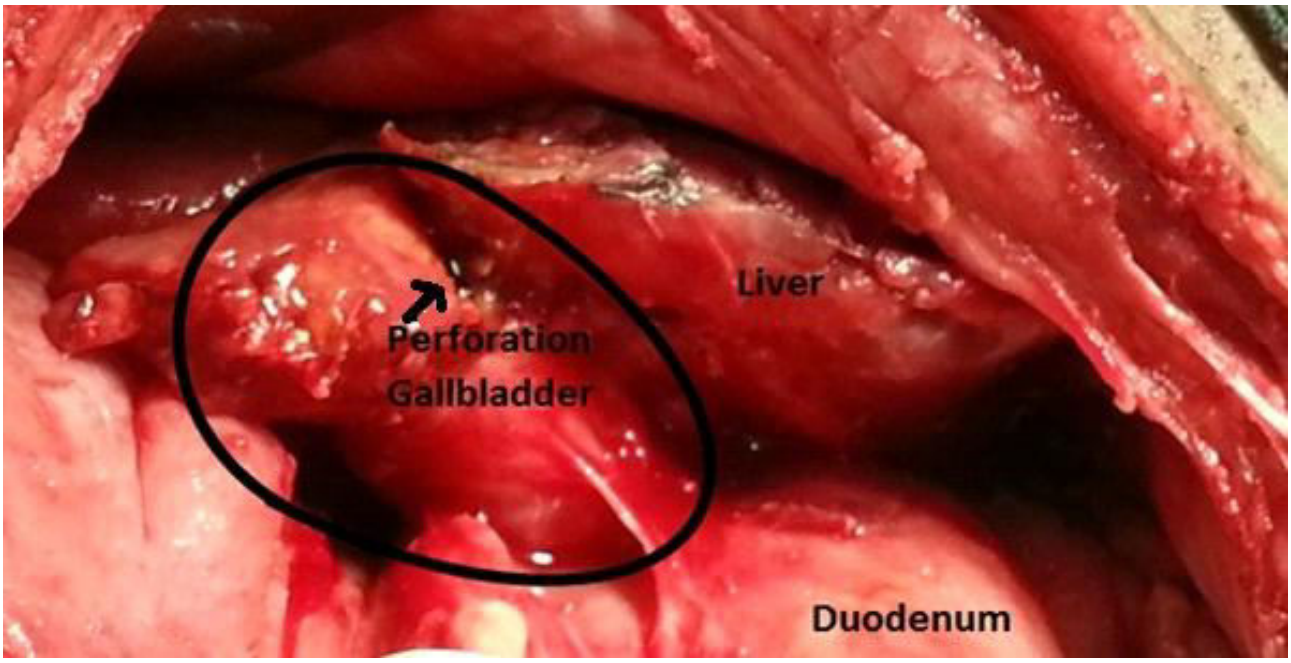

Fig.II: Photograph showing perforation of gall bladder.

approximately 8mm near the fundus. The gall bladder was filled with biliary sludge and it was non-lithiatic. The peritoneal cavity was thoroughly explored and it was concluded that primary pathology causing peritonitis was gall bladder perforation. Cholecystectomy was performed. The patient had an uneventful recovery and was discharged after 10 days.

Discussion:

The chances of gall bladder perforation is more in cases of obstruction of the Gallbladder, resulting in steep rise of intraluminal pressure as it happens in calculus disease of gallbladder. Non obstructive cholecystitis is less likely to cause perforation of the viscus (Essenhigh, 1968).

The intense inflammation coupled with infection with more virulent organisms and existence of a immuno compromised state leads to thrombosis of the blood vessels which predisposes to the setting of transmural necrosis which eventually leads to perforation. Roslyn & Bustte suggested that spontaneous gall bladder perforation is caused by hypoperfusion of the viscera, secondary to systemic disease and also reported that fundus of the gall bladder is the most common site of the perforation (Archampong, 1976). Derici et al (2006) suggested that when GB is perforated at the fundus, there is a possibility that it is not covered by omentum and thus bile drains into the peritoneal spaces leading to peritonitis as it occurs in the other common causes like the peptic ulcer perforation. The occurance of spontaneous gallbladder perforation (GBP) or gangrene in acalculous cholecystitis is rare following typhoid fever (Niemeier, 1934). Perforations of the gallbladder usually occurs in the presence of gall-stone disease, gallbladder malignancies, presence of risk factors e.g. atherosclerosis, diabetes mellitus, congenital anomalies of the biliary system, Gallbladder infections, and pancreatitis. Perforation of the gallbladder was first reported by Duncan of the Royal Infirmary, Edinburg about 135 years ago (Gonsalves, 1979). Gall bladder perforations due to typhoid fever, though known, have been rarely reported over the past two decades (Saxena et al, 2007). Ergul & Gozetlik (2008) in their retrospective study of 1042 cases of Acute Cholecystitis found the incidence of Gallbladder perforation to be 3.55% (37 cases); of which 4 cases were of acalculous type (10.8%). Acute acalculous cholecystitis describes inflammation of the gallbladder without evidence of stones. It occurs in approximately 2-15% of cases of acute cholecystitis with mortality rate ranging from 6% -67 %. Typhoid complicated by cholecystitis has a reported incidence of 2.8% with 1.7% being acalculous (Bhandari et al, 2009). Further, with limited successes of the ultrasound and CT scan for detecting gallbladder perforation and in the absence of specific clinical features/laboratory inputs, an early surgery (laparotomy) or a diagnostic laparoscopy are the final means to reach the diagnosis (Ergul & Gozetlik, 2008). Kim et al (1994) in their comparative study of the CT and Ultrasonography with gallbladder

perforation, detected the site of perforation in 50% of the patients on CT but in none of the patient on ultrasonography.

Peritonitis due to gall bladder perforation is associated with high mortality rate of 39.1% (Essenhigh, 1968). Due to high mortality, timely diagnosis and management of perforated gall bladder is highly crucial. Perforation of the gall bladder must be treated surgically when the diagnosis is made or suspected. Niemeier (1934) classified gallbladder perforations: generalized peritonitis as acute or type I; pericholecystic abscess and localized peritonitis as subacute or type II and Cholecystoenteric fistula as chronic or type III.

The stage & type of presentation may vary; in the present case presentation was delayed. Every case of gallbladder perforation may not have necrosis or gangrene, but may have small perforation as seen by Gunturi et al (2012).

The diagnosis of gallbladder perforation requires high index of suspicion, often it is a per-operative diagnosis. The situation demands prompt and challenging management (Budensab & Annigeri, 2012). The outcome is invariably good with early intervention and cholecystectomy. The preferred procedure is emergency cholecystectomy. Cholecystostomy is an acceptable alternative especially in poor risk patients (Singh et al, 2010).

Conclusion:

Spontaneous perforation of the gallbladder is rarely seen in the absence of gallstone but gall bladder perforation is an occasional complication of typhoid. In patients of typhoid, signs of peritonitis are commonly due to intestinal perforation. Gallbladder perforation secondary to typhoid fever should be considered as a *differential diagnosis* in patients with *suspected typhoid enteric perforation*. Abdominal Ultrasound and Computer tomogram scan has limitations and may not be of help in diagnosing this pathology. However, an early surgical intervention should lead to the intra-operative diagnosis and definitive management.

References:

1. Archampong EQ: Typhoid ileal perforation: why such mortality? *British Journal of Surgery,* 1976;63(4):317-321.
2. Bhandari RS, Luitel BR, Lakhey PJ, Singh KP: Gall bladder complications of typhoid. *Journal of Institute of Medicine*, 2009;13(2): 44-47.
3. Budensab AH, Annigeri VM: Gall bladder gangrene and perforation complicating typhoid fever. *International Journal of Health Sciences and Research,* 2012; 2(9):93-95.
4. Derici H, Kara C, Bozdag AD, Nazli O, Tansug T, Akca E: Diagnosis and treatment of gall bladder perforation. *World Journal of Gastroenterology*, 2006;12(48):7832-7836.
5. Ergul E, Gozetlik EO: Perforation of Gallbladder. *Bratislavski Lekarske Listy (Brateslava Medical Journal)*, 2008; 109(5):210-214.
6. Essenhigh DM: Perforation of the gall-bladder. *British Journal Surgery*, 1968;55(3):175–178.
7. Gonsalves HJ: Spontaneous perforation of the gallbladder due to non-calculus ulcerative cholecystitis. *Journal of the Royal College of Surgeons of Edinburgh*, 1979; 24(3):159-161.
8. Gunturi SRV, Thumma VM, Satheesh B, Nambada M, Prasad R, Solanki R, Nagari B: Gallbladder perforation following typhoid fever - A case report (Personal Communication), 2012.
9. Kim PN, Lee KS, Kim IY, Bae WK, Lee BH: Gallbladder perforation: comparison of US findings with CT. *Abdomen Imaging,* 1994;19(3):239-242.
10. Niemeier OW: Acute free perforation of the Gall-Bladder. *Annals of Surgery*, 1934;99(6):922-924.
11. Saxena V, Basu S, Sharma CL: Perforation of the gall bladder following typhoid fever- induced ileal perforation. *Hong Kong Medical Journal*, 2007 13(6):475-477.
12. Singh S, Mohanty D, Singh B, Jain BK: Enteric Fever with Gall Bladder Perforation. *Tropical Gastroenterology*, 2010;31(1):49-51.
13. Ugwu BT, Yiltok SJ, Kidmas AT, Opaluwa AS: Typhoid intestinal perforation in north central Nigeria. *West African Journal Medicine,* 2005;24(1):1-6.

Source of Support : Nil.
Conflict of Interest: None declared.

Case Report

Bicipital Ribs- A Report of Four Cases

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(Received April, 2013) (Accepted June, 2013)

Abstract:

The Thoracic outlet is bounded by the first thoracic vertebra posteriorly superior border of manubrium sternum anteriorly, and the first rib and costal cartilage laterally. Thoracic outlet syndrome is a common term for a number of disorders producing neurovascular compression over this area. In the collection of bones in the Institute of Anatomy, Madras Medical College. Bicipital ribs i.e., fused first and second ribs were found which is one of the important bony factor leading to thoracic outlet syndrome. The present report will be useful to clinicians while dealing with thoracic outlet syndrome.

Key Words: Thoracic outlet syndrome, fused ribs, bicipital rib, synostosis of ribs.

Introduction:

Although Bicipital Ribs are known scarely for more than a century now but stil it has been scarely reported. A peculiar bifurcation of vertebral end of rib has been observed in the skeleton of some whales. Turner (1883) described Bicipital ribs in two cases. First Sixteen ribs are Bicipital in Icthyosaurs (earliest amphibian tetrapod). The term ´Thoracic outlet syndrome' (TOS) is coined by Peet in 1956 to include a wide variety of symptoms caused by compression of neurovascular bundle at the transition between neck and axilla. It is not a single entity, but is a family of disorders caused by constriction at any one of several anatomical points (Ferguson et al, 1968). Costal anomalies such as cervical ribs, hypertrophied scalenus anterior muscle have been considered as important factors in the development of TOS. Abnormal first and second ribs,fused first and second ribs can also present with thoracic outlet syndrome (White et al, 1945; Baumgartner et al, 1989). An isolated specimen of fused first and second rib was reported (Gupta et al, 2009). A Radiological study reported two cases of fused first and second rib associated with Thoracic outlet syndrome (Baumgartner et al, 1989). Incidence of 0.3% of fused first and second ribs has been reported in a study based on chest radiographs (Etter et al, 1944).

Case Report:

During routine scanning of bones in the Institute of Anatomy,in four specimens there were fused first and second ribs. Present study describes the anatomical features of fused first and second ribs in four specimens. Relevant Anatomical details and measurements were taken using Digital Vernier Caliper.

Case 1: Width of first rib at the tubercle was 12.75 mm Fusion with second rib was seen at 12 mms from tubercle, fusion was from above downwards as if they were overlapping. First rib outline was distinct for 4 cms from tubercle. Shaft of first rib fused with second rib resulting in obliteration of first intercostals space (Fig. I; Table I). At the onset of fusion, an osseus tunnel was present just in front of tubercle. Since it was present between the tubercle, it is named as intertubercular tunnel. The length of the tunnel was 12mms (Fig II). After this point the fusion of the two ribs took place along the outer border of first rib with the inner border of second rib so that they formed a large plate of bone gradually spreading to a maximum width of 27.50mms. Impression for Scalenus medius was present over the superior surface of first rib. Bifurcation took place anteriorly at a distance of 60mm from tubercle of first rib.

Case 2: Width of first rib at the tubercle was 19.86mms (Fig. I; Table I). Fusion took place at a distance of 34mms from tubercle of first rib. There was no interosseous tunnel. First rib outline was visible for 44mms from tubercle.Maximum width of conjoined shaft was 45.18mms. Bifurcation took place anteriorly at a distance of 72mms from tubercle.

Case 3: Bilateral rudimentary first rib fused with second rib. Width of first rib at tubercle on right side was 15.01mms on and left side was 13.29mms (Fig. I; Table II). On the Right side the rudimentary first rib

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immediately fused with second rib near the tubercle. The interosseous tunnel length was 14mms (Fig. II). On the left side the rudimentary fist rib fused with second rib at a distance of 19mms from tubercle. There was no interosseous tunnel on left side. Width of conjoined shaft on right side was 23.01mms, on left side 24.31mms.Bifurcation occured anteriorly 47mms from tubercle on right side and 45mms on left side.

Case 4: Fused first and second rib was present only on left side. First rib fused immediately with second rib behind the tubercle. On right side it was normal. There was no fusion on Right side. Width of first rib on right side at the level of tubercle was 13mms and on left side it was 15mms.Width of conjoined shaft on left side was 23.49mms (Fig. I; Table II). Bifurcation occured 59mms from tubercle on left side. Interosseous tunnel measured 1.4cms on left side (Fig. II).

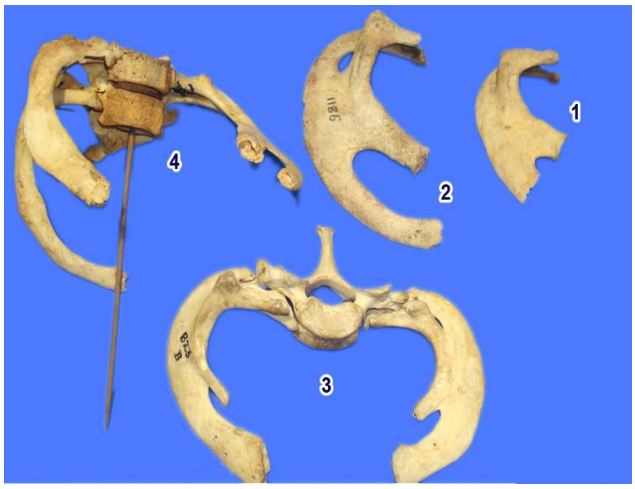

Fig. I: Showing four cases of fused Ribs

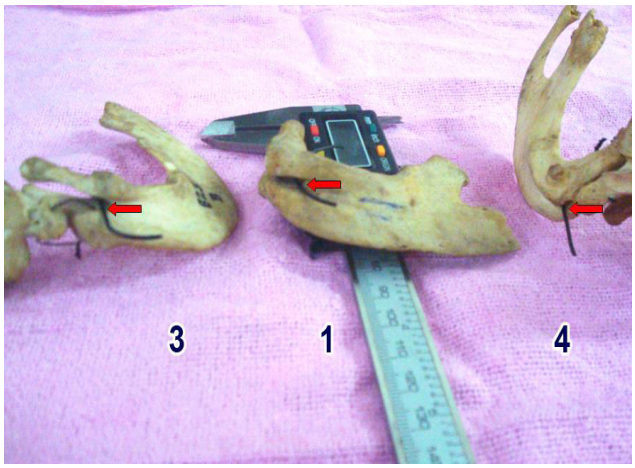

Fig. II: Showing the length of Intertubercular Tunnel (ITT) or Interosseous tunnel (Marked with red arrow).
(Length of ITT is: i. 2 cm, iii. 1.4 cm, iv. 1.4 cm)

Discussion:

Bicipital rib is an unusual anatomical peculiarity which results due to the fusion of shafts of two distinct ribs into a common body and is seen exclusively in relation to the first rib, either due to fusion of a cervical rib with 1st rib or more commonly due to the fusion of the 1st rib with the 2nd. Neurovascular compression at the shoulder is not a single entity, but is a family of disorders caused by constriction at any one of several anatomical points. Many subtle variations were recognized and described as hyper abduction syndrome (Wright, 1945), first rib anomalies (Siderys et al, 1967), costoclavicular syndrome (Falconer & Li, 1962), scalenus medius or pectoralis minor compression (Swank & Simeone, 1944). First rib anomalies include floating rib, rudimentary first rib forming synostosis or pseudorthrosis with second rib, or bifurcated first rib etc. (White et al, 1945) .Anomalous first rib similar to present study was reported (Gupta et al, 2009) where the fused first rib was of normal caliber. Rudimentary first rib forming synostosis with second rib was also reported (Guttentag & Salwen, 1999; Stapford & Telford,1919). Bicipital rib anomaly may occur when a cervical rib fuses with vertebral end of the first rib or the first rib may be rudimentary and may fuse with the second rib making a bicipital rib (Thomas & Jamieson, 1937). Rib anomalies has been traditionally classified into: 1) Numerical and 2) Structural.

Numerical anomalies are common like supernumerary (cervical / lumbar) and deficient pair of 11th ribs. Structural abnormalities are quite rare & they can be further classified into a) short ribs b) replacement of costal cartilage /part of rib shaft by fibrous tissue c) fused ribs. (Rani et al, 2009). Fusion anomalies can again be classified as Bicipital, Bifid or bridged varieties. The ribs normally develop as extensions of sclerotome tissue in the thoracic region (Arey, 1965). It has been stated that there are atleast 22 known syndromes in which fused ribs are a constant component. Klippel Feil, Jarco Levin, Poland and Gorlin syndrome are few among them (Rani et al, 2009).

In the present study the first,second and fourth specimens, first rib was of normal caliber. Only in the third specimen first rib was rudimentary and was fused with second rib. First rib malformation like rudimentary rib, fused rib are commonly associated with post fixed brachial plexus (Stapford & Telford, 1919; White et al, 1945). Possibly the first and second thoracic nerves

Table I: Width of Bicital RIB from Tubercle of 1st Rib. mm

Case No.	Width of 1st Rib (at the tubercle)	Distance of fusion width 2nd rib (from tubercle)	Length of the 1st un-fused outer border of 1st Rib	Maximum width of fused ribs	Distance of Bifurcation of fused ribs (from tubercle)
1	12.75	14.00	40.00	27.50	60.00
2	19.86	34.00	44.00	45.18	72.00

Table II: Width of Bicipital Rib from Tubercle of 1st Rib, mm

Case No.	Width of 1st Rib (at the tubercle)		Distance of fusion width 2nd rib (from tubercle)		Length of the 1st un-fused outer border of 1st Rib		Maximum width of fused ribs		Distance of Bifurcation of fused ribs (from tubercle)	
	R	L	R	L	R	L	R	L	R	L
3	15.01	13.29	10	20	33	26	23.01	24.31	47.00	45.00
4	13	15	-	6	-	29	-	23.49	-	59.00

may get stretched over the broadened fused shaft resulting in neurological symptoms of Thoracic outlet compression (Stapford & Telford, 1919). Compression of neurovascular structures may occur while passing from neck to axilla between first rib and scalenus anterior muscle, hypertrophied scalenus medius (Dale & Lewis, 1975). The intertubercular tunnel might transmit first intercostals nerve or posterior intercostal vessels and could form a potential site for nerve entrapment or vascular compression (Gupta et al, 2009). Intertubercular tunnel was present in first, third and fourth specimens. In the second specimen the fusion of first rib with second rib took place 3.4cms from tubercle of first rib. Similar occurrence was reported by (Deepak & Dakshayani, 2011). Significant vascular compromise have been reported with fused first and second rib hence it warrents an early diagnosis and surgical intervention (Baumgartner et al,1989).

Conclusion:

Rib abnormalities at upper end of thoracic cage is due to defective bone segmentation which may be associated with variation in disposition of vessels and nerves(Todd, 1912).Rib fusion causes scoliosis and restriction of chest wall expansion which may require surgical correction (Glass et al, 2002). The present case report i.e.,fused rib or Bicipital rib is not only an Anatomical curiosity but it is both clinically and surgically important variation which may predispose to Thoracic outlet compression.

References:

1. Arey LB. Morphogenesis of skeleton. In: Developmental anatomy-A textbook and laboratory manual of Embryology, 7th Edn.; W.B Saunders Company, Philadelphia , 1965, pp.405-410.
2. Baumgartner F, Nelson RJ, Robertson JM: The rudimentary first rib: A cause of thoracic outlet syndrome with arterial compromise. *Archives of Surgery*, 1989;124(9): 1090-1092.
3. Dale WA, Lewis MR: Management of Thoracic outlet syndrome. *Annals of Surgery*, 1975;181(5):575-585.
4. Deepak S, Dakshayani KR: An unusual case of bicipital rib. *Anatomica Karnataka*, 2011;5(1):50-52.
5. Etter LE: Osseous abnormalities in Thoracic cage seen in forty thousand consecutive chest photoroent-genograms. *American Journal of Roentgenology*, 1944;51:359-383.
6. Falconer MA, Li FW: Resection of First Rib in Costoclavicular compression of the Brachial plexus. *Lancet*, 1962;1(7220):59-63.
7. Ferguson TB, Burford TH, Roper CL: Neurovascular compression at the Superior Thoracic Aperture. *Annals of Surgery*, 1968;167(4):573-579.
8. Glass RB, Norton KI, Mitre SA, Kang E: Paediatric ribs a spectrum of abnormalities, *Radiographics,* 2002;22(1);87-104.
9. Gupta V, Suri RK, Gayatri R, Hitendra L: Synostosis of first and second thoracic ribs: Anatomical and radiological assessment. *International Journal of Anatomical Variations*, 2009;2:131-133.
10. Guttentag AR, Salwen JK: Keep your eyes on the ribs.The spectrum of normal variants and dissection that

involve the ribs. *Radiographics,* 1999;19(5),1125-1142 .
11. Rani A, Rani A, Chopra J, Manik P: Synostosis of first & second rib-case report. *Journal of Anatomical Society of India,* 2009;58(2):189-191.
12. Siderys H, Walker D, Pittman JN: Anomalous First Rib as a Cause of the Thoracic outlet Syndrome. *The Journal of the American Medical Association*, 1967;199(2):133-134.
13. Stapford JSB, Telford ED: Compression of the lower trunk of brachial plexus by a first dorsal rib with a note on surgical treatment. *British Journal of Surgery*, 1919;7(26);168-177.
14. Swank RL, Simeone FA: The Scalenus Anticus Syndrome, Types; Their Charecterisation, Diagnosis and Treatment. *Archives of Neorology & Psychiatry*, 1944;51(5);432-445.
15. Thomas MA, Jamieson EB: Osteology. In: Cunningham´s textbook of Anatomy. JC Brash, EB Jamieson, (Eds.); 7th End.; Oxford University press London, 1937;pp,132.
16. Todd TW: Costal anomalies of the Thoracic outlet,their interpretation and significance. *Anatomischer Anzeiger*, 1912;41:251-271.
17. Turner WM: Cervical ribs and the so called Bicipital ribs in man in relation to corresponding structures in the Cetacea. *Journal of Anatomy & Physiology*, 1883; 17(part 3):384-400.
18. White JC, Poppel MH, Adams R: Congenital malformations of the first thoracic rib: A cause of brachial neuralgia which simulates the cervical rib syndrome. *Surgery Gynecology Obstetrics*, 1945;81:643-659.
19. Wright IS: The Neurovascular Syndrome Produced by Hyperabduction of the Arm. *American Heart Journal*, 1945, 29(1):1 -19.

Source of Support : Nil.
Conflict of Interest: None declared.

Case Report

Peripheral Giant Cell Granuloma: A Case Report and Review of Literature

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(Received January, 2013) (Accepted June, 2013)

Abstract:

Peripheral Giant Cell Granuloma or so called "Giant cell epulis" is the most common oral giant cell lesion.It usually presents as a purplish-red soft tissue nodule consisting of multinucleated giant cells in a background of mononuclear stromal cells and extravasated red blood cells. This lesion probably does not represent a true neoplasm but it may be a reactive in nature which is believed to be stimulated by local irritation or trauma, but the cause is not known with certainty. A case of peripheral giant cell granuloma arising at the left maxillary premolar region in a 18 year old boy is being reported here. The lesion was completely excised upto the periosteum level; there was no residual or recurrence of swelling or bony defect apparent in the area of biopsy after a follow-up period of 1 year.

Key Words: Peripheral giant cell Granuloma, Epulis.

Introduction:

Peripheral giant cell granuloma (PGCG) is the most common oral giant cell lesion as a soft tissue extra-osseous purplish-red nodule. This lesion is probably not a true neoplasm but could be a reactive in nature. The initiating stimulus is believed to be due to local irritation or trauma but the cause is not known with certainity. It has also been termed as a peripheral giant cell reparative granuloma; but whether it is in fact reparative, has not been established and their osteoclastic activity appears doubtful. Their membrane receptors for calcitonin, demonstrated by immuno -histochemistry and their osteoclastic activity when cultured *in vitro* are evidence that they are osteoclasts (Bonetti et al, 1990; Lim & Gibbins 1995; Mighell et al, 1996), whereas other authors have suggested that the lesion is formed by cells of the mononuclear phagocyte system (Carvalho et al, 1995). The PGCG bears a close microscopic resemblance to the central giant cell granuloma, and hence some pathologists believe that it may represent a soft tissue counterpart of the central bony lesion (Katsikeris et al, 1988).

The lesion can be sessile or pedunculated, penetrating through periodontal membrane and may or may not be ulcerated. Occasionally lesions arise from the periosteum overlying edentulous area. Secondary ulceration due to trauma may give the lesions a focal yellow zone caused by the formation of fibrin clot over the ulcer.

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Lesions can become large, sometimes attaining a size upto 2 cm. The clinical appearance is similar to the more common pyogenic granuloma, although the PGCG is often more bluish-purple as compared with the bright-red colour of a typical pyogenic granuloma. Recently, the PGCG associated with dental implants has been reported (Hirshberg et al, 2003). Although the PGCG develops within soft tissue, superficial resorption of the underlying alveolar bony crest is sometimes seen. On occasion, it may be difficult to determine whether the mass arose as a peripheral lesion or a central giant cell granuloma eroding through the cortical plate into the gingival soft tissues (Chadwick et al, 1989; Giansanti & Waldrom, 1969).

Rarely a giant cell epulis may be due to hyperparathyroidism, representing the so-called osteoclastic "brown tumours" associated with this endocrine disorder (Smith et al, 1988; Burkes & White, 1989) and is then likely to be associated with other lesions in bones and changes in the blood chemistry. The extra-osseous lesions of cherubism involving the gingiva appear very similar to giant cell epulide. However, the other distinctive clinical and radiological features of cherubism indicate the correct diagnosis (Odell & Morgan, 1998). Histologically, PGCG is composed of nodules of multinucleated giant cells in a background of plump ovoid and spindle-shaped mesenchymal cells and extravasated red blood cells. The giant cells may contain only a few nuclei or up to several dozen. Some of them are large, vesicular nuclei; others are small, pyknotic nuclei. The origin of the giant cell is unknown.

Case Report

A 18 year old boy was referred to the Department of Oral & Maxillofacial Surgery, People's Dental Academy, Bhopal for an non-tender exophytic lesion in the left maxillary premolar region since May, 2010 (Fig. I). Since then the lesion had gradually increased in size. It bled from time to time but the patient did not seek any treatment. The patient had no significant medical history. The clinical differential diagnoses included PGCG, pyogenic granuloma and haemangioma. The excisional biopsy was undertaken upto the periosteum level under local anaesthesia, and

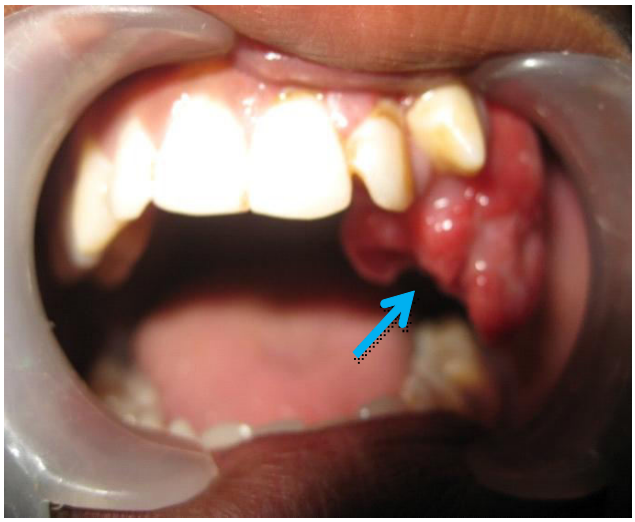

Fig. I: A red exophytic, non-painful lesion arising in the maxillary left premolar area

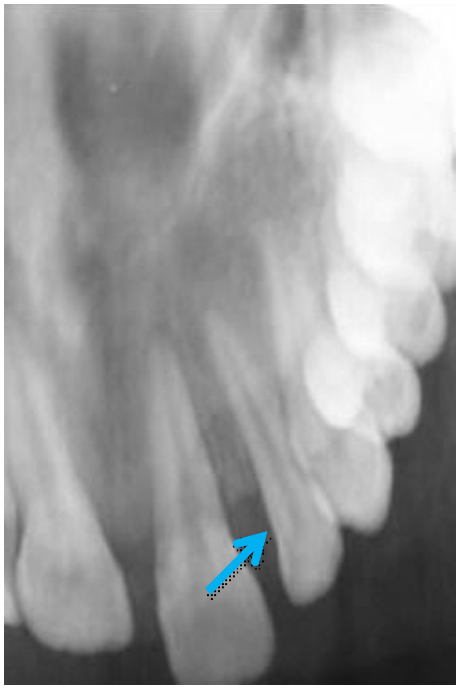

Fig. II: Bone loss associated with the lesion, as seen on the occlusal view.

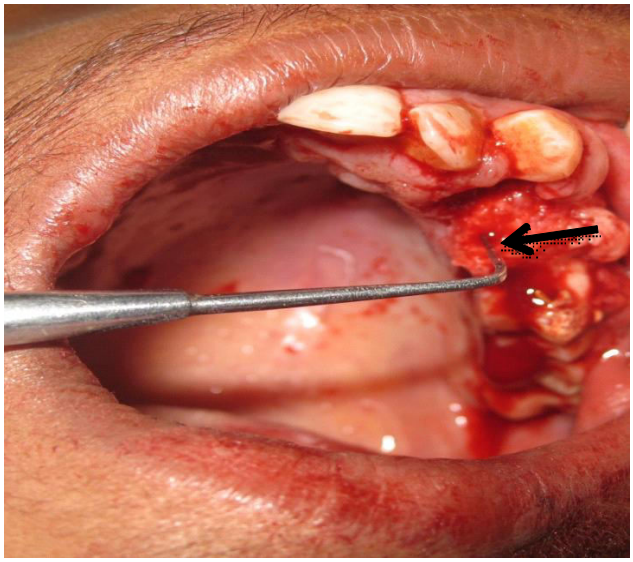

Fig. III: Irritational factor as seen during exploration of lesion.

haemostasis was achieved by electrocautery and Surgicel. The irritational factor was seen during exploration of lesion (Fig. III).To prevent recurrence of tumour, denuded bone was treated with Carnoy's solution. Chlorhexidine mouth rinse was prescribed post-operatively twice a day for 7 days.

On gross examination, the excised nodule was red in colour and measured 30 x 20 x 35mm in maximum dimension. There was periodontal bone loss in the maxillary left canine region (Fig. II). Due to the extensive nature of lesion, there was displacement of maxillary left canine.

Histologically, the overlying epithelium was composed of aggregates of multinucleated giant cells

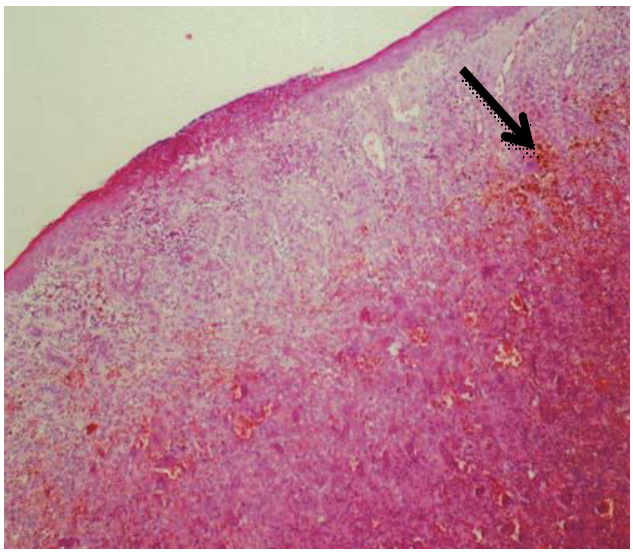

Fig. IV. Photomicrograph showing aggregates of multinucleated giant cells in a background of mononuclear stromal cells, extravasated erythrocytes and deposits of haemosiderin (H & E Stain, 100X).

in a background of mononuclear stromal cells, extravasated red blood cells and deposits of haemosiderin (Fig. IV). After a period of 6 months, no residual or recurrence of swelling or bony defect was seen. The patient was then referred to the Department of Prosthodontics and the Department of Periodontics for a new partial denture and periodontal treatment.

Discussion:

The etiology and nature of PGCG (giant cell epulide) still remains undecided. In the past, several hypotheses had been proposed to explain the nature of multinucleated giant cells, one of them is that they are osteoclasts left from physiological resorption of teeth or reaction to injury to periosteum. Now there is a strong evidence that these cells are osteoclasts as they have been shown to possess receptors for calcitonin and were able to excavate bone *in vitro* (Flanagan et al 1988).

The study of Lim & Gibbins (1995) confirmed that the multinucleated giant cells reacted strongly for a monoclonal antibody (MB1) which reacts with lymphocytes and a proportion of T cells and monocytes. The MB1 antibody has previously been shown to be expressed by osteoclasts in fetal bone. Interestingly, the re-expression of the blood vessels in the lesion for the widely used endothelial cell marker factor VIII related antigen had failed to demonstrate the presence of blood vessels other than on the periphery of the lesion although these lesions appear to be extremely vascular in nature.

There is also a growing body of opinion that giant cells may simply represent a reactionary component of the lesion and are derived via blood stream from bone marrow mononuclear cells and may be present only in response to an yet unknown stimulus from the stroma. This concept is based on the results of some more recent studies using cell culture and transplantation (el Mofty & Osdoby, 1985; Cohen et al, 1988) in which the giant cells have been found to be short lived and to disappear early in culture in contrast to the active proliferation of the stromal cells.

A study by Wulling et al (2001) revealed that the stromal cells secrete a variety of cytokines and differentiation factors, including Monocyte chemo-attractant protein-1 (MCP1), Osteoclast differentiation factor (ODF), and Macrophage-colony stimulating factor (M-CSF). These molecules are monocyte chemo-attractants and are essential for osteoclast differentiation, this suggest that the stromal cell stimulates blood monocyte immigration into tumour tissue and enhances their fusion into osteoclast like multinucleated giant cells. Further more, the recently identified membrane-bound protein family a disintegrin and metalloprotease (ADAM) is considered to play a role in the multinucleation of osteoclasts and macrophage derived giant cells from mononuclear precursor cells (Abe et al, 1999).

In a recent study by Liu et al (2003), *in situ* hybridization was carried out to detect the mRNA expression of the receptor activator of NF-kappaB ligand (RANKL), that is shown to be essential in the osteoclastogenesis, its receptor RANKL and its decoy receptor osteopritegrin (OPG). They concluded that RANKL and OPG expressed in these lesions may play on important role in the formation of multinucleated giant cells.

There are no pathognomonic clinical features whereby these lesions can be differentiated from other forms of gingival enlargement including pyogenic granuloma, fibrous epulis, peripheral ossifying fibroma, inflammatory fibrous hyperplasia, peripheral odontogenic fibroma, hemangiomacaverosum and papilloma. Microscopic examination is required for the definitive diagnosis(Carranza & Hogan, 2012; Chaparro-Avendano et al, 2005).

Generally, this lesion is clinically indistinguishable from a pyogenic granuloma, although a PGCG is more likely to cause bone resorption than pyogenic granuloma, the differences are otherwise minimal (Regezi et al, 2008). Microscopically, the lesion arises from, or is at least attached to the periodontal ligament or mucoperiosteum. The most characteristic histological features include a non-encapsulated highly cellular mass with abundant giant cells, inflammation, interstitial hemorrhage, hemosiderin deposits and mature bone or osteoid.

Fibroblasts are the basic element of peripheral giant cell granulomas. Scattered among the plump, young fibroblasts are numerous multinucleated giant cells with abundant eosinophilic cytoplasm which appear to be non-functional in the usual sense of phagocytosis and bone resorption(Regezi et al, 2008). Two types of giant cells are mainly found, one representing metabolically active cells (Type I) and the other representing dying cells (Type II). The origin of these cells has not been defined yet. However, a striking similarity between these cells and osteoclasts does exist (Katsikeris et al, 1988). Both the type of

cells consists of multiple, large, ovoid, vesicular, somewhat translucent nuclei with prominent nucleoli and the nuclear chromatin was located peripherally on distinct nuclear membrane. Type I cells vary in size, often exceeding 100µ in diameter.The type II cells are fewer in number, have smaller and more irregular nuclei than type I. The nucleoli are not easily seen and the cytoplasm stains deeply eosinophilic and granular than the type I cells (Bhaskar et al, 1971).

Despite ultrastructural studies, the true nature of the giant cells in PGCG remains debatable (Bonetti et al, 1990).Inflammation is a constant finding but is varied not only in degree but also in location. The inflammatory cells consist primarily of lymphocytes, plasma cells, histiocytes and occasional polymorphonuclear cells. Rarely, ulceration was an associated feature (Bhaskar et al, 1971).

Vascular proliferation, especially capillary, was found in a study of Peralles et al (2006). Calcified tissue which is found in some of the lesions varying from small amorphous foci to well developed trabeculae (Bhaskar et al, 1971). The woven bone or lamellar bone is thought to be produced by mononuclear stromal cells, which resemble latent proliferative osteoblasts or osteoprogenitor cells. Thus, it is not surprising that woven bone and lamellar bone are formed in PGCG (Dayan et al, 1990). No correlation was found between amount of bone with location or reported duration of the lesion (Giansanti & Waldron, 1969). The histologic appearance is similar to that of a giant cell granuloma of the jaw, but for the fact that the epulis has a covering of stratified squamous epithelium (Regezi et al, 2008). In rare instances, both a soft tissue and intraosseous lesion can co-exist. The overlying mucosal surface is ulcerated in about 50% cases. A "clear zone" of dense fibrous connective tissue usually separates the giant cell proliferation from the mucosal surface (Neville et al, 2009).

Treatment consists of local surgical excision down to the underlying bone, for extensive clearing of the base (Neville et al, 2009).Removal of local factors or irritants is also required(Regezi et al, 2008). If resection is only superficial, the growth may recur. Exposure of all bony walls following thorough surgical resection responds satisfactorily most of the times. Recurrence rate of 5.0-70.6% (average 9.9%) has been reported in various epidemiologic studies (Mighell et al, 1996).

A recurrence rate of 5% has been reported by Giansanti & Waldron (1969). Recurrence is believed to be related to lack of inclusion of the periosteum or periodontal ligament in the excised specimen (Regezi et al, 2008). A re-excision must be performed for these cases (Neville et al, 2009). Aggressive tendencies or malignant transformation of these lesions has never been reported (Katsikeris et al, 1988). The treatment rendered in this case was surgical excision to the bone, chemical cauterization and curettage followed by oral prophylaxis.The 1 year follow-up has shown no recurrence indicating that the given treatment along with maintenance of a good oral hygiene is sufficient to treat PGCG.

References:

1. Abe E, Mocharla H, Yamate T, Taguchi Y. Monolages SC: Meltrin-alpha, a fusion protein involved in multinucleated giant cell and osteoclast formation. *Calcified Tissue International,* 1999;64(6): 508-515.
2. Bhaskar SN, Cutright DE, Beasley JD, Perez B: Giant cell reparative granuloma (peripheral): report of 50 cases. *Journal of Oral Surgery,* 1971;29(2):110-115.
3. Bonetti F, Pelosi G, Martignoni G, Mombello A, Zamboni G, Pea M, Scarpa A, Chilosi M: Peripheral giant cell granuloma: evidence for osteoclastic differentiation. *Oral Surgery, Oral Medicine & Oral Pathology*, 1990;70(4): 471-475.
4. Burkes EJ (Jr.), White RP (Jr.): A peripheral giant-cell granuloma manifestation of primary hyperparathyroidism: report of case. *Journal of the American Dental Association*, 1989;118(1): 62-64.
5. Carranza FA, Hogan EL: Peridontal Pathology-Gingival Enlargements. In: Carranza's Clinical Periodontology. MG Newman, H Takei, PR Klokkevold, RA Rarranga (Eds.); 10th Edn.; Elsevier Saunders, St Louis; 2012.pp.84-95.
6. Carvalho YR, Loyola AM, Gomez RS, Araujo VC: Peripheral giant cell granuloma. An immunohistochemical and ultrastructural study. *Oral Diseases*, 1995;(1)1: 20-25.
7. Chadwick BL, Crawford PJ, Aldred MJ: Massive giant cell epulis in a child with familial cyclic neutropenia. *British Dental Journal*, 1989;16(8):279-281.
8. Chaparro-Avendano AV, Berini-Aytés L, Gay-Escoda C: Peripheral giant cell granuloma. A report of five cases and review of literature. *Medicina Oral, Patologia, Oral & Cirugia Buccal*, 2005;10(1): 48-52.
9. Cohen MA, Grossman ES, Thompson SH: Features of central giant cell granuloma of the jaws xenografted in nude mice. *Oral Surgery, Oral Medicine & Oral Pathology*, 1988;66(2): 209-217.
10. Dayan D, Buchner A, Spirer S: Bone formation in Peripheral giant cell granuloma. *Journal of Periodontology*, 1990; 61(7): 444-446.

11. Eversole LR, Rovin S: Reactive lesions of the gingiva. *Journal of Oral Pathology*, 1972;1(1):30-38.
12. el-Mofty SK, Osdoby P: Growth behavior and lineage of isolated and cultured cells derived from giant cell granuloma of the mandible. *Journal of Oral Pathology*, 1985;14(7):539-552.
13. Flanagan AM, Nui B, Tinkler SM, Horton MA, Williams MD, Chambers DJ: The multinucleated giant cell granulomas of the jaws are osteoclasts. *Cancer,* 1988;62(6):1139-1145.
14. Giansanti JS, Waldron CA: Peripheral giant cell granuloma: review of 720 cases. *Journal of Oral Surgery*, 1969;17(10):787-791.
15. Hirshberg A, Kozlovsky A, Schwartz-Arad D, Mardinger O, Kaplan I: Peripheral giant cell granuloma associated with dental implants. *Journal of Periodontology*, 2003;74(9):1381-1384.
16. Katsikeris N, Kakarantza-Angelopoulou E, Angelopoulos AP: Peripheral giant cell granuloma. Clinicopathologic study of 224 new cases and review of 956 reported cases. *International Journal of Oral Maxillofacial Surgery*, 1988;17(2):94-99.
17. Lim L, Gibbins JR: Immunohistochemical and ultra structural evidence of a modified microvasculature in the giant cell granuloma of the jaws. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology & Endodontics*, 1995;79(2):190-198.
18. Liu B, Yu SF, Li TJ: Multinucleated giant cells in various forms of giant cell containing lesions of the jaws express features of osteoclasts. *Journal of Oral Pathology & Medicine*, 2003; 32(6):367-375.
19. Mighell AJ, Robinson PA, Hume WJ: PCNA and Ki-67 immunoreactivity in multinucleated cells of giant cell fibroma and peripheral giant cell granuloma. *Journal of Oral Pathology & Medicine*, 1996; 25(5):193-199.
20. Neville B, Allen CM, Damm DD, Bouquot JE: Soft Tissue Tumors. In: Oral and Maxillofacial Pathology. 3rd Edn.; Elsevier Saunders, St. Louis; 2009.pp.507-563.
21. Odell EW, Morgan PR: Biopsy Pathology of the Oral Tissues (Biopsy pathology series 22). Chapman & Hall Medical, London, 1998.pp. 486.
22. Peralles PG, Viana APB, Azevedo ALR, Pires FR: Gingival and alveolar hyperplastic reactive lesions: clinicopathological study of 90 cases. *Brazilian Journal of Oral Sciences,* 2006; 5(18):1085-1089.
23. Regezi JA, Sciubba JJ, Jordan RCK. Red-Blue lesions: In: Oral Pathology: Clinical Pathologic Correlations. 5th Edn.; Elsevier Saunders, St. Louis; 2008.pp.107-125.
24. Smith BR, Fowler CB, Svane TJ: Primary hyperparathyroidism presenting as a "peripheral" giant cell granuloma. *Journal of Oral & Maxillofacial Surgery*, 1988;46(1): 65-69.
25. Wulling M, Engels C, Jesse N, Werner M, Delling G, Kaiser E: The nature of giant cell tumor of bone. *Journal of Cancer Research & Clinical Oncology*, 2001;127(8): 467-474.

Source of Support : Nil.
Conflict of Interest: None declared.

Case Report

Pregnancy Induced Gingival Enlargement-A Case Report

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(Received November, 2012) (Accepted June, 2013)

Abstract:

Gingival enlargement is a common clinical problem, sometimes associated with specific conditions. This condition finds a unique place in the literature, because it has been associated with a variety of local and systemic factors.In puberty and pregnancy, gingival enlargement can be due to poor oral hygiene, inadequate nutrition, or systemic variation in hormonal stimulation.

This case report present the clinical , histopathological features as well as the treatment of the inflammatory gingival enlargement in pregnancy, where pregnancy altered the tissue metabolism which disturbed the aesthetics and masticatory function of the patient.

Key Words: Pregnancy. Gingival enlargement, Gingivectomy.

Introduction:

Gingival enlargement is a common clinical entity but finds a unique place in the literature, because it has been associated with a variety of local and systemic factors so differential diagnosis becomes an important aspect for complete management of the lesion. Most of the causative factors lead to an unusual hyperplastic tissue response to chronic inflammation associated with local irritants such as plaque, calculus or bacteria.Hormonal changes occurring during pregnancy and puberty, however, have long been known to be associated with varying types of gingival enlargement. Hormonal changes can significantly potentiate the effects of local irritants on gingival connective tissue. In all forms of enlargements, good oral hygiene is necessary to minimize the effects of systemic factors; gingivoplasty or gingivectomy may be required, but should be done in combination with prophylaxis and oral hygiene instructions (Kapoor et al, 2010). Generalized gingival enlargement may vary from mild enlargement of interdental papillae to such severe uniform enlargement that the crowns of the teeth may be covered by hyperplastic tissue (Gungormus et al, 2002). The association between gingival enlargement and pregnancy is widely recognized. Increased gingival inflammation during pregnancy follows the hormonal cycle. It begins with increasing gonadotropin levels and is maintained throughout 4 to 8 months of pregnancy. An increase in the proportion of *Prevotella intermedia* in bacterial plaque, rather than an increase in total plaque, is instrumental in the development of gingival inflammation during pregnancy. Increased levels of oestrogen and progesterone during pregnancy also stimulate increased gingival vascular permeability and oedema, respectively (McLeod et al, 2009).

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Case Report:

A 26-year-old woman reported to the Department of Periodontology, Subharti Dental College and Hospital, Meerut, with the complaint of gum swelling in lower front anterior region (Fig. I). Patient also complained of difficulty in chewing and concern for the aesthetics. The patient had not previously used any medication known to provoke gingival enlargement. She was in her fourth month of pregnancy when she noticed this enlargement. An intra-oral examination revealed the presence of Grade III enlargement in relation to the maxillary and mandibular anterior teeth region, with gingival bleeding on probing seen at 90 (75%) of 120 sites probed; average probing depth was of 3-6 mm with deeper pockets in anterior teeth region. The plaque index was found to be fair on examination.

Treatment:

After taking the thorough case history full mouth scaling and root planning was performed. Patient was motivated for the maintenance of oral hygiene. The tissue was excised by external bevel gigivectomy. Haemostasis was achieved and patient was put on analgesic and antibiotic. The excised tissue was sent for histopathological examination. The report showed

Fig. I: Photograph showing Pre-operative view.

Fig. II: Photograph showing Intra-operative view.

Fig. III: Photograph showing 1 month post-operative view.

hyperplastic stratified squamous epithelium with underlying connective tissue stroma showing increased collagen fibers and intense inflammatory cell infiltrate in diffuse pattern (Fig. IV) These features were suggestive of nonspecific inflammatory gingival enlargement. One month recall checkup showed uneventful healing (Fig. III).

Discussion:

Gingival changes in pregnancy were described as early as 1898, even before knowledge about hormonal changes was available (Kapoor et al, 2010). Incidence of gingivitis in pregnancy varies from around 50% to 100% (Buddiga et al, 2012). The primary role

Fig. IV: Photograph showing Histopathologcial Report.

of microbial plaque in initiating gingivitis and periodontal destruction is well established. While examining other contributory factors such as the effects of hormonal flux in pregnancy on periodontal disease status, it is mandatory to isolate the effects of plaque (Tilakaratne et al, 2000).

Gingivitis in pregnancy is caused by bacterial plaque, like in non-pregnant individuals. Pregnancy accentuates the gingival response to plaque. The correlation between gingivitis and the quantity of plaque was greater after parturition than during pregnancy, which suggests that pregnancy induces other factors that aggravate gingival response to local irritants (Kapoor et al, 2010). The patient's recent pregnancy makes pregnancy gingivitis an attractive explanation for the hyperplastic gingiva. High hormone levels during puberty and pregnancy lead to more pronounced gingivitis and possible marginal enlargement, depending on the level of plaque control prior to puberty or pregnancy. An overgrowth of *Prevotella intermedia*, together with vascular change and oedema associated with high levels of oestrogen/progesterone, is the primary explanation for the gingival inflammation and gingival enlargement (McLeod et al, 2009). There is an increase in gingival inflammation between the 14th and 30th weeks of pregnancy and that this will occur despite a fall in the amount of plaque at the dento-gingival junction. This implicates other factors in addition to plaque accumulation to explain the increased inflammation. It was confirmed that there are marked increase in the plasma levels of oestradiol and progesterone between the 14th and 30th weeks of pregnancy but it was not possible to demonstrate a direct association between these increases and the increase in gingival inflammation (O'Neil, 1979).

These results are consistent with a significant role of oestrogen during primate pregnancy in the

regulation of cellular proliferation and differentiation within the gingiva (Reynolds et al, 2004). The gingivitis associated with pregnancy has been attributed to increased concentrations of circulating estrogen and/ or progesterone. However, the mechanism by which these steroids increase gingival inflammation is not known. Interleukin-6 (IL-6), a pleiotropic cytokine produced by many cell types including human gingival fibroblasts (hGF), is secreted in response to inflammatory challenges such as bacterial lipopolysaccharide and interleukin-1 (IL-1). Cellular proliferation and the number of cells entering the S-phase of the cell cycle are significantly increased in mass cultures of fibroblasts stimulated by oestradiol (Ovadia et al, 2007).

Conclusion:

The local factors i.e. plaque and calculus are known to be responsible for gingival enlargement during pregnancy. The hormonal factors also play a role in aggravating the enlargement. Therefore, the importance of regular check-up and oral prophylaxis cannot be overlooked.In the present case, size of the hyperplastic tissue was interfering with the patient's ability to chew, speak and was causing serious esthetic problems, therefore, it was excised completely. Future studies conducted on this aspect would provide us with the better information regarding the etiology of pregnancy induced gingival enlargement.

References:

1. Bokenkamp A, Bohnhorst B, Biere C, Albers N, Offner G, Brodehl J: Nifedipene aggravates cyclosporine A-induced gingival hyperplasia. *Pediatrics Nephrology,* 1994;8(2):181-185.
2. Buddiga V, Ramagoni NK, Snehalatha, Mahantesh: Gingival enlargement-a case series. *Annals and Essences of Dentistry,* 2012;4(1):73-76.
3. Güngörmüs M, Akgül HM, Yilmaz AB, Dagistanli S, Erciyas K: Generalized Gingival Hyperplasia Occurring during Pregnancy. *The Journal of International Medical Research,* 2002;30(3):353-355.
4. Kapoor A, Malhotra R, Grover V, Saxena D: Pregnancy Associated Gingival Enlargement. *Journal of Oral Health & Community Dentistry,* 2010;4(2):48-51.
5. McLeod DE, Stoeckel D, Contreras J, Reyes E: Severe Postpartum Gingival Enlargement. *Journal of Periodontology,* 2009;80(8):1365-1369.
6. O'Neil TC: Plasma Female Sex-Hormone Levels and Gingivitis in Pregnancy. *Journal of Periodontology,* 1979;50(6):279-282.
7. Ovadia R, Zirdok R, Diaz-Romero RM: Relationship between pregnancy and periodontal disease. *Medicine and Biology,* 2007;14(1):10-14.
8. Reynolds MA, Aberdeen GW, Pepe GJ, Sauk JJ, Albrecht ED: Estrogen Suppression Induces Papillary Gingival Overgrowth in Pregnant Baboons. *Journal of Periodontology*, 2004;75(5):693-701.
9. Tilakaratne A, Soory M, Ranasinghe AW, Corea SM, Ekanayake SL, de Silva M: Periodontal disease status during pregnancy and 3 months post-partum, in a rural population of Sri-Lankan women. *Journal of Clinical Periodontology,* 2000;27(10):787-792.

Source of Support : Nil.
Conflict of Interest: None declared.